Kawasaki VERSYS 1000

Motorcycle Service Manual

Quick Reference Guide

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This quick reference guide will assist you in locating a desired topic or procedure.

- Bend the pages back to match the black tab of the desired chapter number with the black tab on the edge at each table of contents page.
- Refer to the sectional table of contents for the exact pages to locate the specific topic required.

Kawasaki

VERSYS 1000

Motorcycle Service Manual

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The right is reserved to make changes at any time without prior notice and without incurring an obligation to make such changes to products manufactured previously. See your Motorcycle dealer for the latest information on product improvements incorporated after this publication.

All information contained in this publication is based on the latest product information available at the time of publication. Illustrations and photographs in this publication are intended for reference use only and may not depict actual model component parts.

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LIST OF ABBREVIATIONS

A	ampere(s)	in.	inch(s)
ABDC	after bottom dead center	km/h	kilometers per hour
ABS	antilock brake system	KTRC	Kawasaki traction control system
AC	alternating current	L	liter(s)
Ah	ampere hour	LCD	liquid crystal display
ATDC	after top dead center	LED	light emitting diode
BBDC	before bottom dead center	lb	pound(s)
BDC	bottom dead center	m	meter(s)
BTDC	before top dead center	min	minute(s)
°C	degree(s) Celsius	mmHg	millimeters of mercury
cmHg	centimeters of mercury	mph	miles per hour
CU	central prcessing unit	N	newton(s)
cu in	cubic inch(s)	oz	ounce(s)
DC	direct current	Pa	pascal(s)
DFI	digital fuel injection	PS	horsepower
DOHC	double overhead camshaft	psi	pound(s) per square inch
DOT	department of transportation	qt	quart(s)
ECU	electronic control unit	r	revolution
F	farad(s)	rpm	revolution(s) per minute
°F	degree(s) Fahrenheit	s	second(s)
ft	foot, feet	TDC	top dead center
g	gram(s)	TIR	total indicator reading
gal	gallon(s)	V	volt(s)
h	hour(s)	W	watt(s)
HP	horsepower(s)	Ω	ohm(s)
IC	integrated circuit		

COUNTRY AND AREA CODES

AT	Austria	EUR	Europe
AU	Australia	GB	United Kingdom
BR	Brazil	SEA-B2	Southeast Asia B2
CA	Canada	WVTA (FULL H)	WVTA Model with Honeycomb Catalytic Converter (Full Power)
CH	Switzerland	GB WVTA (FULL H)	WVTA Model with Honeycomb Catalytic Converter (Left Side Traffic, Full Power)
DE	Germany	WVTA (78.2 H)	WVTA Model with Honeycomb Catalytic Converter (78.2 Kw Power)

EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated crankcase emission (1) and exhaust emission (2) control systems in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board. Additionally, Kawasaki has incorporated an evaporative emission control system (3) in compliance with applicable regulations of the California Air Resources Board on vehicles sold in California only.

1. Crankcase Emission Control System

This system eliminates the release of crankcase vapors into the atmosphere. Instead, the vapors are routed through an oil separator to the intake side of the engine. While the engine is operating, the vapors are drawn into combustion chamber, where they are burned along with the fuel and air supplied by the fuel injection system.

2. Exhaust Emission Control System

This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel, ignition, and exhaust systems of this motorcycle have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels.

The exhaust system of this model motorcycle manufactured primarily for sale in California includes a catalytic converter system.

3. Evaporative Emission Control System

Vapors caused by fuel evaporation in the fuel system are not vented into the atmosphere. Instead, fuel vapors are routed into the running engine to be burned, or stored in a canister when the engine is stopped. Liquid fuel is caught by a vapor separator and returned to the fuel tank.

The Clean Air Act, which is the Federal law covering motor vehicle pollution, contains what is commonly referred to as the Act's "tampering provisions".

"Sec. 203(a) The following acts and the causing thereof are prohibited.

(3)(A) for any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title prior to its sale and delivery to the ultimate purchaser, or for any manufacturer or dealer knowingly to remove or render inoperative any such device or element of design after such sale and delivery to the ultimate purchaser.

(3)(B) for any person engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines, or who operates a fleet of motor vehicles knowingly to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title following its sale and delivery to the ultimate purchaser..."

NOTE

○ *The phrase "remove or render inoperative any device or element of design" has been generally interpreted as follows.*

1. *Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.*
2. *Tampering could include.*
   - *a. Maladjustment of vehicle components such that the emission standards are exceeded.*
   - *b. Use of replacement parts or accessories which adversely affect the performance or durability of the motorcycle.*
   - *c. Addition of components or accessories that result in the vehicle exceeding the standards.*
   - *d. Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.*

WE RECOMMEND THAT ALL DEALERS OBSERVE THESE PROVISIONS OF FEDERAL LAW, THE VIOLATION OF WHICH IS PUNISHABLE BY CIVIL PENALTIES NOT EXCEEDING $10 000 PER VIOLATION.

TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

Federal law prohibits the following acts or the causing thereof. (1) The removal or rendering inoperative by any person other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or (2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

Among those acts presumed to constitute tampering are the acts listed below.

- Replacement of the original exhaust system or muffler with a component not in compliance with Federal regulations.
- Removal of the muffler(s) or any internal portion of the muffler(s).
- Removal of the air box or air box cover.
- Modifications to the muffler(s) or air intake system by cutting, drilling, or other means if such modifications result in increased noise levels.

Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. However, it contains enough detail and basic information to make it useful to the owner who desires to perform his own basic maintenance and repair work. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, all adjustments, maintenance, and repair should be carried out only by qualified mechanics.

In order to perform the work efficiently and to avoid costly mistakes, read the text, thoroughly familiarize yourself with the procedures before starting work, and then do the work carefully in a clean area. Whenever special tools or equipment are specified, do not use makeshift tools or equipment. Precision measurements can only be made if the proper instruments are used, and the use of substitute tools may adversely affect safe operation.

For the duration of the warranty period, we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your vehicle.

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki Motorcycle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki motorcycles are introduced by the Service Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

How to Use This Manual

In this manual, the product is divided into its major systems and these systems make up the manual's chapters. The Quick Reference Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

For example, if you want ignition coil information, use the Quick Reference Guide to locate the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Ignition Coil section.

Whenever you see symbols, heed their instructions! Always follow safe operating and maintenance practices.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

This manual contains four more symbols which will help you distinguish different types of information.

NOTE

○ *This note symbol indicates points of particular interest for more efficient and convenient operation.*

- Indicates a procedural step or work to be done.

○ Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.

★ Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

In most chapters an exploded view illustration of the system components follows the Table of Contents. In these illustrations you will find the instructions indicating which parts require specified tightening torque, oil, grease or a locking agent during assembly.

General Information

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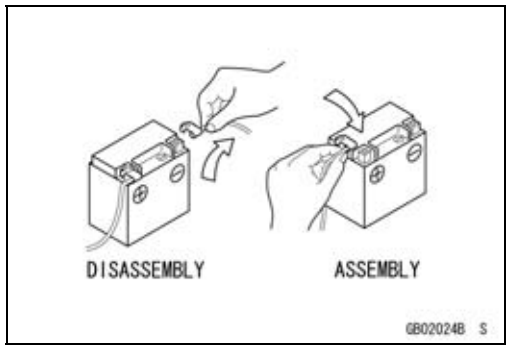
Before Servicing

Before starting to perform an inspection service or carry out a disassembly and reassembly operation on a motorcycle, read the precautions given below. To facilitate actual operations, notes, illustrations, photographs, cautions, and detailed descriptions have been included in each chapter wherever necessary. This section explains the items that require particular attention during the removal and reinstallation or disassembly and reassembly of general parts.

Especially note the following.

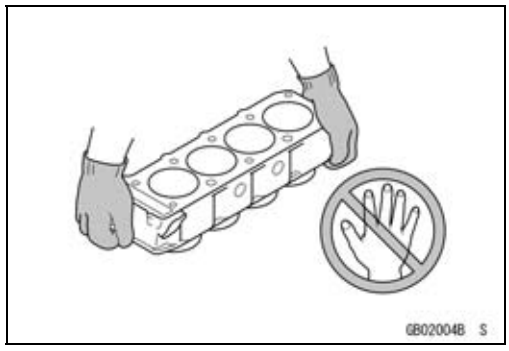
Battery Ground

Before completing any service on the motorcycle, disconnect the battery cables from the battery to prevent the engine from accidentally turning over. Disconnect the ground cable (–) first and then the positive (+). When completed with the service, first connect the positive (+) cable to the positive (+) terminal of the battery then the negative (–) cable to the negative terminal.



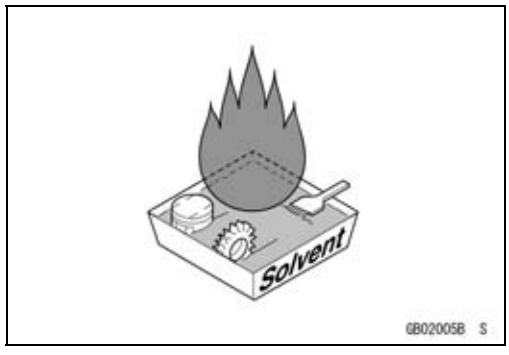
Edges of Parts

Lift large or heavy parts wearing gloves to prevent injury from possible sharp edges on the parts.



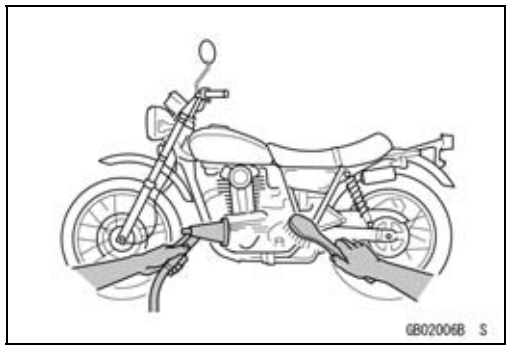
Solvent

Use a high-flush point solvent when cleaning parts. High -flush point solvent should be used according to directions of the solvent manufacturer.



Cleaning Vehicle before Disassembly

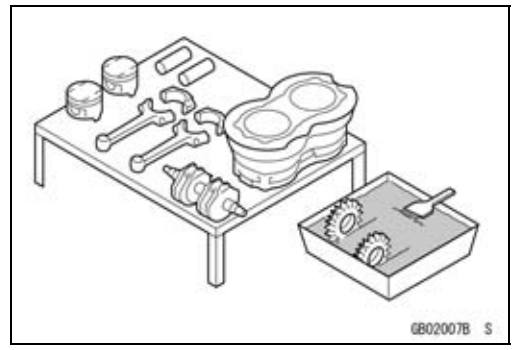
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



Before Servicing

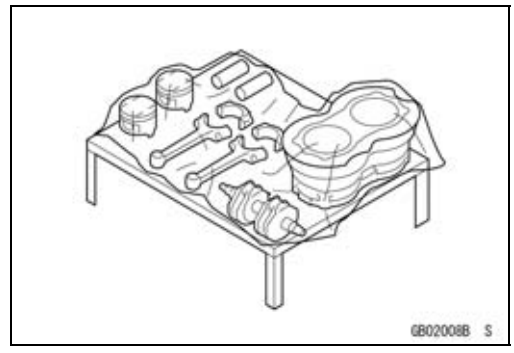
Arrangement and Cleaning of Removed Parts

Disassembled parts are easy to confuse. Arrange the parts according to the order the parts were disassembled and clean the parts in order prior to assembly.



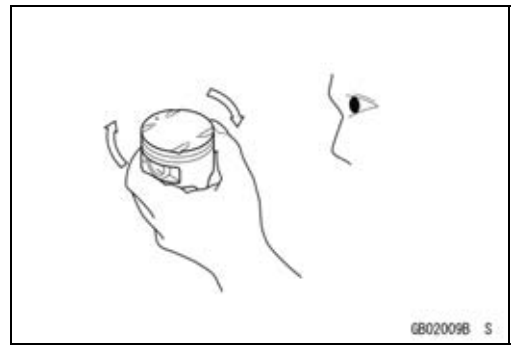
Storage of Removed Parts

After all the parts including subassembly parts have been cleaned, store the parts in a clean area. Put a clean cloth or plastic sheet over the parts to protect from any foreign materials that may collect before re-assembly.



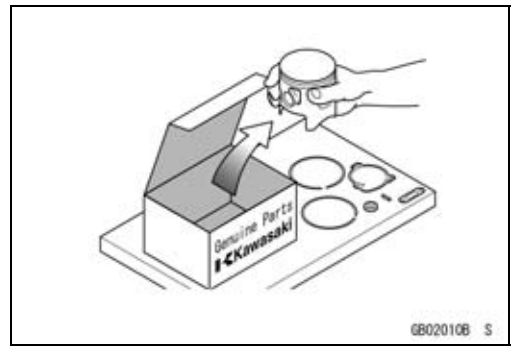
Inspection

Reuse of worn or damaged parts may lead to serious accident. Visually inspect removed parts for corrosion, discoloration, or other damage. Refer to the appropriate sections of this manual for service limits on individual parts. Replace the parts if any damage has been found or if the part is beyond its service limit.



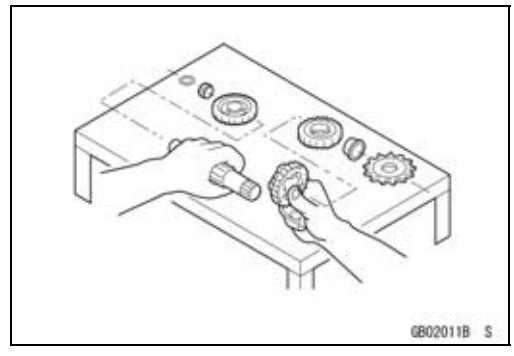
Replacement Parts

Replacement parts must be KAWASAKI genuine or recommended by KAWASAKI. Gaskets, O-rings, oil seals, grease seals, circlips, cotter pins or self-locking nuts must be replaced with new ones whenever disassembled.



Assembly Order

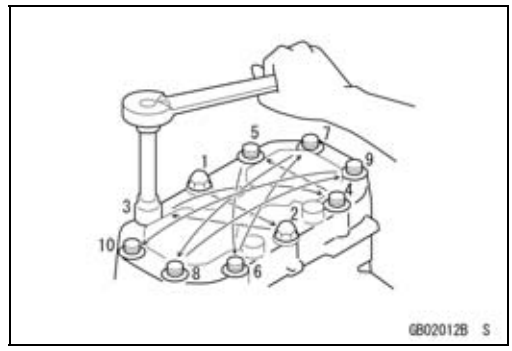
In most cases assembly order is the reverse of disassembly, however, if assembly order is provided in this Service Manual, follow the procedures given.



Before Servicing

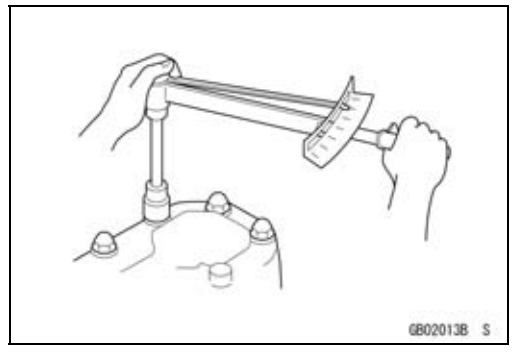
Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter turn and then remove them. If the specified tightening sequence is not indicated, tighten the fasteners alternating diagonally.



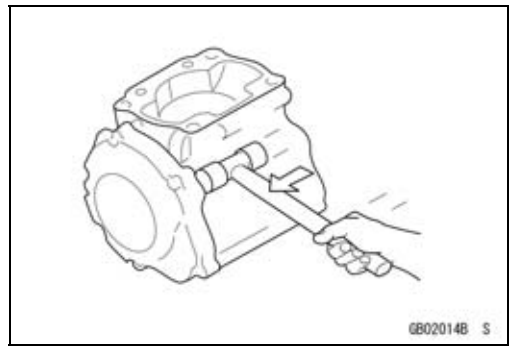
Tightening Torque

Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.



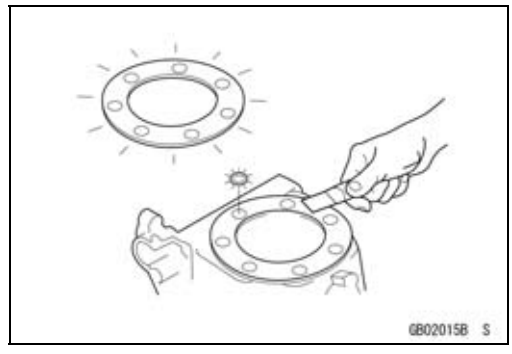
Force

Use common sense during disassembly and assembly, excessive force can cause expensive or hard to repair damage. When necessary, remove screws that have a non-permanent locking agent applied using an impact driver. Use a plastic-faced mallet whenever tapping is necessary.



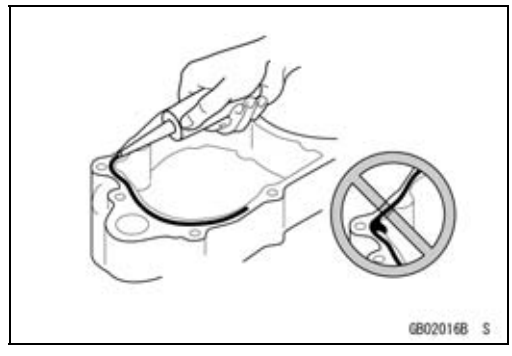
Gasket, O-ring

Hardening, shrinkage, or damage of both gaskets and O-rings after disassembly can reduce sealing performance. Remove old gaskets and clean the sealing surfaces thoroughly so that no gasket material or other material remains. Install the new gaskets and replace the used O-rings when re-assembling.



Liquid Gasket, Non-permanent Locking Agent

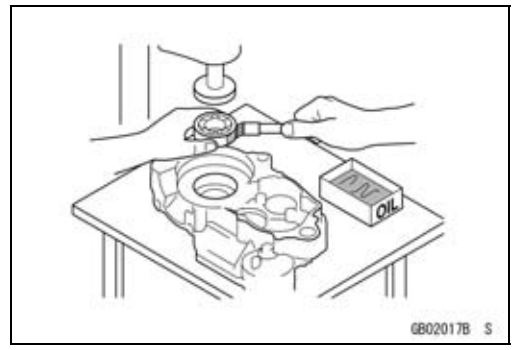
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



Before Servicing

Press

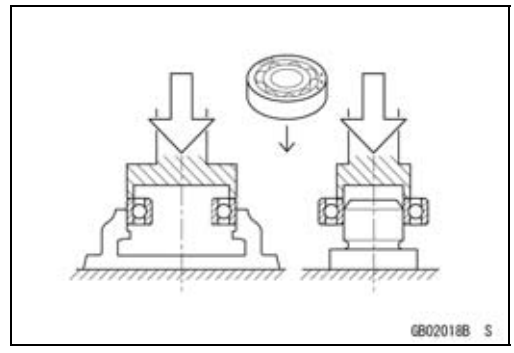
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing and Needle Bearing

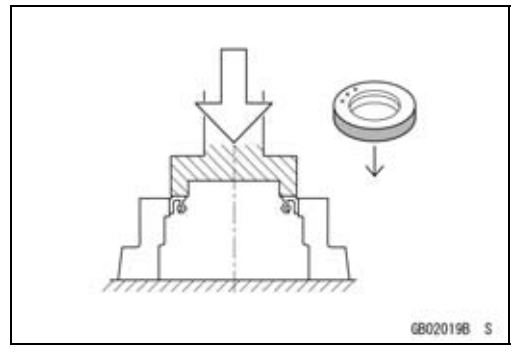
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

Pressing the incorrect race can cause pressure between the inner and outer race and result in bearing damage.

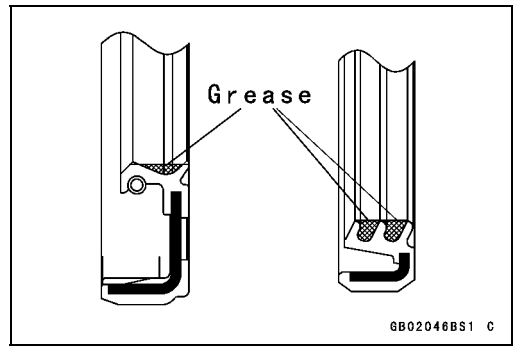


Oil Seal, Grease Seal

Do not remove pressed oil or grease seals unless removal is necessary. Replace with new ones whenever removed. Press new oil seals with manufacture and size marks facing out. Make sure the seal is aligned properly when installing.

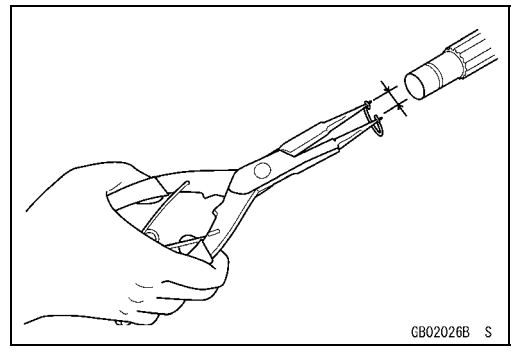


Apply specified grease to the lip of seal before installing the seal.



Circlips, Cotter Pins

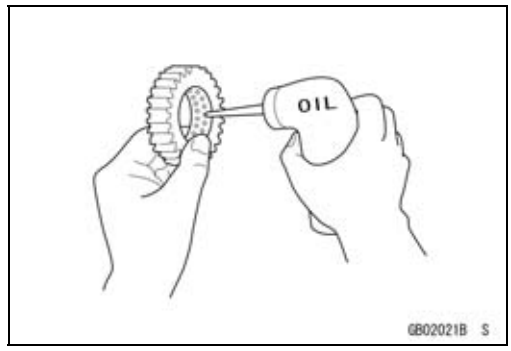
Replace the circlips or cotter pins that were removed with new ones. Take care not to open the clip excessively when installing to prevent deformation.



Before Servicing

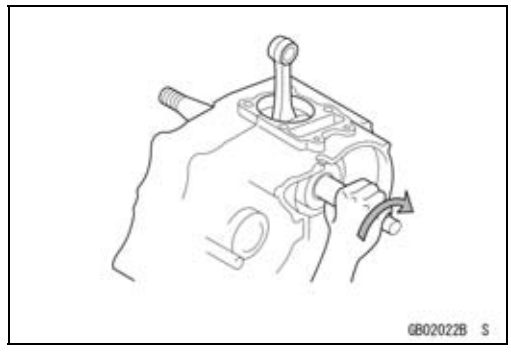
Lubrication

It is important to lubricate rotating or sliding parts during assembly to minimize wear during initial operation. Lubrication points are called out throughout this manual, apply the specific oil or grease as specified.



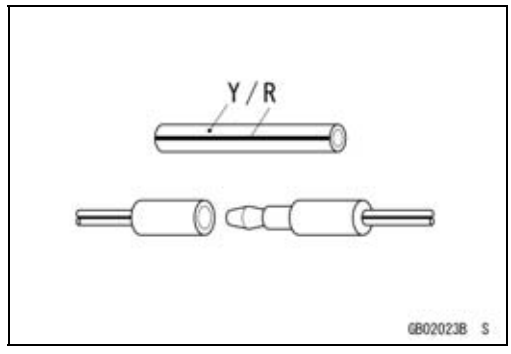
Direction of Engine Rotation

When rotating the crankshaft by hand, the free play amount of rotating direction will affect the adjustment. Rotate the crankshaft to positive direction (clockwise viewed from output side).



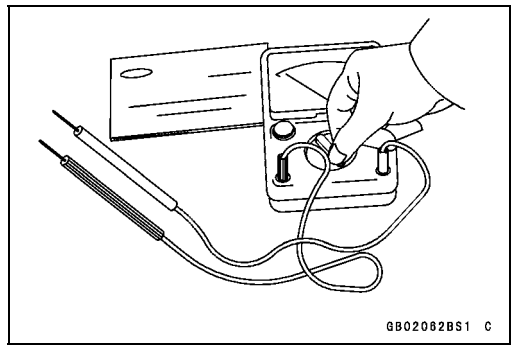
Electrical Wires

A two-color wire is identified first by the primary color and then the stripe color. Unless instructed otherwise, electrical wires must be connected to those of the same color.



Instrument

Use a meter that has enough accuracy for an accurate measurement. Read the manufacture's instructions thoroughly before using the meter. Incorrect values may lead to improper adjustments.

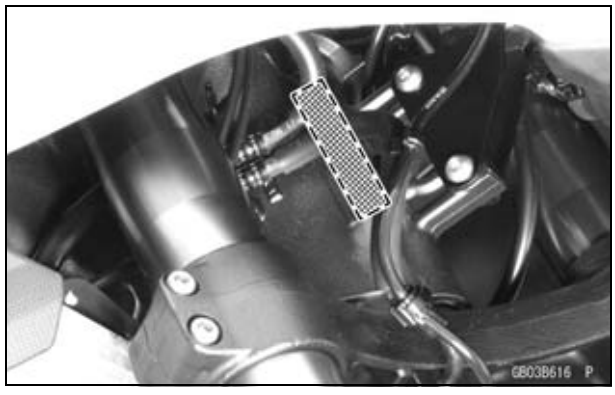


Model Identification

KLZ1000AC (Europe) Left Side View

KLZ1000AC (Europe) Right Side View

Frame Number



Engine Number

General Specifications

Items	KLZ1000AC
Dimensions	
Overall Length	2 235 mm (87.99 in.)
Overall Width	900 mm (35.4 in.)
Overall Height/High Position	1 405 mm (55.31 in.)/1 430 mm (56.3 in.)
Wheelbase	1 520 mm (59.84 in.)
Road Clearance	155 mm (6.10 in.)
Seat Height	845 mm (33.3 in.)
Curb Mass:	239 kg (527 lb)
Front	117 kg (258 lb)
Rear	122 kg (269 lb)
Fuel Tank Capacity	21.0 L (5.55 US gal.)
Performance	
Minimum Turning Radius	3.0 m (9.8 ft)
Engine	
Type	4-stroke, DOHC, 4-cylinder
Cooling System	Liquid-cooled
Bore and Stroke	77.0 × 56.0 mm (3.03 × 2.20 in.)
Displacement	1 043 cm³ (63.64 cu in.)
Compression Ratio	10.3 : 1
Maximum Horsepower	86.8 kW (118 PS) @9 000 r/min (rpm) (WVTA (78.2 H)) 78.2 kW (106 PS) @9 000 r/min (rpm) (CA) – – –
Maximum Torque	102 N·m (10.4 kgf·m, 75 ft·lb) @7 700 r/min (rpm) (WVTA (78.2 H)) 96 N·m (9.8 kgf·m, 71 ft·lb) @6 800 r/min (rpm) (CA) – – –
Carburetion System	FI (Fuel Injection) KEIHIN TTK38 × 4
Starting System	Electric starter
Ignition System	Battery and coil (transistorized)
Timing Advance	Electronically advanced (digital igniter)
Ignition Timing	From 10° BTDC @1 100 r/min (rpm) to 40.2° BTDC @5 200 r/min (rpm)
Spark Plug	NGK CR9EIA-9
Cylinder Numbering Method	Left to right, 1-2-3-4
Firing Order	1-2-4-3
Valve Timing:	
Intake:	
Open	24° BTDC
Close	44° ABDC
Duration	248°
Exhaust:	
Open	45° BBDC
Close	19° ATDC
Duration	244°
Lubrication System	Forced lubrication (wet sump)

General Specifications

Items	KLZ1000AC
Engine Oil:	
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2
Viscosity	SAE 10W-40
Capacity	4.0 L (4.2 US qt)
Drive Train	
Primary Reduction System:	
Type	Gear
Reduction Ratio	1.627 (83/51)
Clutch Type	Wet multi disc
Transmission:	
Type	6-speed, constant mesh, return shift
Gear Ratios:	
1st	2.692 (35/13)
2nd	1.950 (39/20)
3rd	1.529 (26/17)
4th	1.304 (30/23)
5th	1.136 (25/22)
6th	0.958 (23/24)
Final Drive System:	
Type	Chain drive
Reduction Ratio	2.867 (43/15)
Overall Drive Ratio	4.471 @Top gear
Frame	
Type	Tubular, diamond
Caster (Rake Angle)	27°
Trail	107 mm (4.21 in.)
Front Tire:	
Type	Tubeless
Size	120/70 ZR17 M/C (58W)
Rim Size	J17M/C × MT3.50
Rear Tire:	
Type	Tubeless
Size	180/55 ZR17 M/C (73W)
Rim Size	J17M/C × MT5.50
Front Suspension:	
Type	Telescopic fork (upside-down)
Wheel Travel	150 mm (5.91 in.)
Rear Suspension:	
Type	Swingarm
Wheel Travel	150 mm (5.91 in.)
Brake Type:	
Front	Dual discs
Rear	Single disc

General Specifications

Items	KLZ1000AC
Electrical Equipment	
Battery	12 V 8 Ah
Headlight:	
Type	Semi-sealed beam
High Beam	12 V 55 W
Low Beam	12 V 55 W
Tail/Brake Light	LED
Alternator:	
Type	Three-phase AC

Specifications are subject to change without notice, and may not apply to every country.

Unit Conversion Table

Prefixes for Units:

Prefix	Symbol	Power
mega	M	× 1 000 000
kilo	k	× 1 000
centi	c	× 0.01
milli	m	× 0.001
micro	μ	× 0.000001

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

L	×	0.2642	=	gal (US)
L	×	0.2200	=	gal (IMP)
L	×	1.057	=	qt (US)
L	×	0.8799	=	qt (IMP)
L	×	2.113	=	pint (US)
L	×	1.816	=	pint (IMP)
mL	×	0.03381	=	oz (US)
mL	×	0.02816	=	oz (IMP)
mL	×	0.06102	=	cu in

Units of Force:

N	×	0.1020	=	kg
N	×	0.2248	=	lb
kg	×	9.807	=	N
kg	×	2.205	=	lb

Units of Length:

km	×	0.6214	=	mile
m	×	3.281	=	ft
mm	×	0.03937	=	in

Units of Torque:

N·m	×	0.1020	=	kgf·m
N·m	×	0.7376	=	ft·lb
N·m	×	8.851	=	in·lb
kgf·m	×	9.807	=	N·m
kgf·m	×	7.233	=	ft·lb
kgf·m	×	86.80	=	in·lb

Units of Pressure:

kPa	×	0.01020	=	kgf/cm²
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cmHg
kgf/cm²	×	98.07	=	kPa
kgf/cm²	×	14.22	=	psi
cmHg	×	1.333	=	kPa

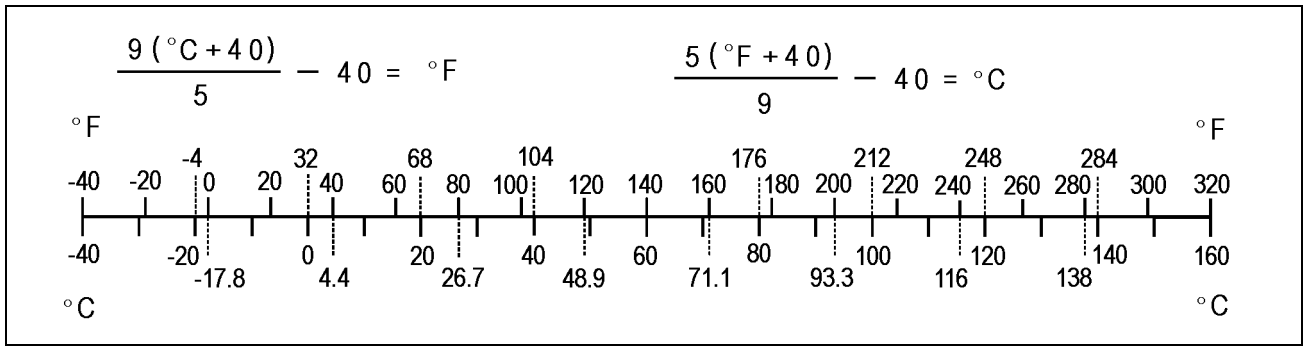
Units of Speed:

km/h	×	0.6214	=	mph

Units of Power:

kW	×	1.360	=	PS
kW	×	1.341	=	HP
PS	×	0.7355	=	kW
PS	×	0.9863	=	HP

Units of Temperature:



Periodic Maintenance

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Periodic Maintenance Chart

The scheduled maintenance must be done in accordance with this chart to keep the motorcycle in good running condition.**The initial maintenance is vitally important and must not be neglected.**

Periodic Inspection

FREQUENCY / ITEM		Whichever comes first ➡ / ⬇ Every	* ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	36 (22.5)	See Page
Fuel System										
Throttle control system (play, smooth return, no drag) - inspect		year	●		●		●		●	2-15
Engine vacuum synchronization - inspect					●		●		●	2-15
Idle speed - inspect			●		●		●		●	2-19
Fuel leak (fuel hose and pipe) - inspect		year	●		●		●		●	2-19
Fuel hose and pipe damage - inspect		year	●		●		●		●	2-19
Fuel hose and pipe installation condition - inspect		year	●		●		●		●	2-19
Cooling System										
Coolant level - inspect			●		●		●		●	2-20
Coolant leak (water hose and pipe) - inspect		year	●		●		●		●	2-21
Water hose damage - inspect		year	●		●		●		●	2-21
Water hose installation condition - inspect		year	●		●		●		●	2-21
Engine Top End										
Valve clearance - inspect	CA Model						●			2-21
	Other than CA Models		Every 42 000 km (26 250 mile)							2-21
Air suction system damage - inspect					●		●		●	2-26
Clutch										
Clutch operation (play, disengagement, engagement) - inspect			●		●		●		●	2-27
Wheels and Tires										
Tire air pressure - inspect		year			●		●		●	2-28
Wheel/tire damage - inspect					●		●		●	2-28
Tire tread wear, abnormal wear - inspect					●		●		●	2-28
Wheel bearing damage - inspect		year			●		●		●	2-29
Final Drive										
Drive chain lubrication condition - inspect #		Every 600 km (400 mile)								2-30
Drive chain slack - inspect #		Every 1 000 km (600 mile)								2-30

2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

FREQUENCY / ITEM	Whichever comes first ➡ / Every ⬇	* ODOMETER READING × 1 000 km (× 1 000 mile)							See Page
		1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	36 (22.5)	
Drive chain wear - inspect #				●		●		●	2-32
Drive chain guide wear - inspect				●		●		●	2-33
Brakes									
Brake fluid leak (brake hose and pipe) - inspect	year	●	●	●	●	●	●	●	2-34
Brake hose and pipe damage - inspect	year	●	●	●	●	●	●	●	2-35
Brake hose and pipe installation condition - inspect	year	●	●	●	●	●	●	●	2-35
Brake operation (effectiveness, play, no drag) - inspect	year	●	●	●	●	●	●	●	2-35
Brake fluid level - inspect	6 months	●	●	●	●	●	●	●	2-36
Brake pad wear - inspect #			●	●	●	●	●	●	2-37
Brake light switch operation - inspect		●	●	●	●	●	●	●	2-37
Suspension									
Front forks/rear shock absorber operation (damping and smooth stroke) - inspect				●		●		●	2-38
Front forks/rear shock absorber oil leak - inspect	year			●		●		●	2-38, 2-39
Rocker arm operation - inspect				●		●		●	2-39
Tie-rods operation - inspect				●		●		●	2-39
Steering									
Steering play - inspect	year	●		●		●		●	2-39
Steering stem bearings - lubricate	2 years					●			2-41
Electrical System									
Lights and switches operation - inspect	year			●		●		●	2-42
Headlight aiming - inspect	year			●		●		●	2-44
Sidestand switch operation - inspect	year			●		●		●	2-45
Engine stop switch operation - inspect	year			●		●		●	2-46
Others									
Chassis parts - lubricate	year			●		●		●	2-47
Bolts and nuts tightness - inspect		●		●		●		●	2-49

#: Service more frequently when operating in severe conditions; dusty, wet, muddy, high speed or frequent starting/stopping.

*: For higher odometer readings, repeat at the frequency interval established here.

Periodic Maintenance Chart

Periodic Replacement Parts

FREQUENCY / ITEM	Whichever comes first → / Every ↓	* ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6)	12 (7.5)	24 (15)	36 (22.5)	48 (30)	See Page
Air cleaner element # - replace	Every 18 000 km (11 250 mile)						2-50
Fuel hose - replace	5 years						2-50
Coolant - change	3 years				●		2-52
Radiator hose and O-ring - replace	3 years				●		2-54
Engine oil # - change	year	●	●	●	●	●	2-55
Oil filter - replace	year	●	●	●	●	●	2-55
Brake hose - replace	4 years					●	2-56
Brake fluid - change	2 years			●		●	2-58
Rubber parts of master cylinder and caliper - replace	4 years					●	2-59, 2-60
Spark plug - replace			●	●	●	●	2-63

#: Service more frequently when operating in severe conditions; dusty, wet, muddy, high speed or frequent starting/stopping.

*: For higher odometer readings, repeat at the frequency interval established here.

Torque and Locking Agent

The following tables list the tightening torque for the major fasteners requiring use of a non-permanent locking agent or silicone sealant etc.

Letters used in the “Remarks” column mean:
AD: Apply adhesive (ThreeBond: TB1344N or equivalent).
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.
Si: Apply silicone grease (ex. PBC grease).
SS: Apply silicone sealant.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System (DFI)				
Switch Housing Screws	3.5	0.36	31 in·lb	
Upper Air Cleaner Housing Screws	1.1	0.11	10 in·lb	
Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
Air Cleaner Duct Clamp Bolts	2.0	0.20	18 in·lb	
Delivery Pipe Assy Mounting Screws	3.4	0.35	30 in·lb	
Oxygen Sensor	44	4.5	32	
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Intake Air Temperature Sensor Mounting Screw	1.2	0.12	11 in·lb	
Water Temperature Sensor	12	1.2	106 in·lb	
Fuel Pump Bolts	9.8	1.0	87 in·lb	L
Cooling System				
Radiator (Water) Hose Clamp Screws	2.9	0.30	26 in·lb	
Coolant By-pass Fitting Bolt	8.8	0.90	78 in·lb	L
Thermostat Housing Bolts	5.9	0.60	52 in·lb	L
Water Pipe Bolts	12	1.2	106 in·lb	L
Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
Water Pump Cover Bolts	11	1.1	97 in·lb	
Coolant Drain Bolt	11	1.1	97 in·lb	
Engine Top End				
Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	L
Spark Plugs	13	1.3	115 in·lb	
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
Camshaft Sprocket Bolts	15	1.5	11	L
Upper Camshaft Chain Guide Bolts	12	1.2	106 in·lb	S
Camshaft Cap Bolts	12	1.2	106 in·lb	S
Cylinder Head Bolts (M10) (First)	20	2.0	15	S, MO
Cylinder Head Bolts (M10) (Final)	54	5.5	40	S, MO
Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
Plugs	19.6	2.00	14.5	L
Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
Rear Camshaft Chain Guide Bolt	25	2.5	18	
Front Camshaft Chain Guide Bolt (Lower)	12	1.2	106 in·lb	
Coolant By-pass Fitting Bolt	8.8	0.90	78 in·lb	L
Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
Camshaft Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	
Muffler Body Mounting Bolt	34	3.5	25	
Premuffler Chamber Mounting Bolt	34	3.5	25	
Muffler Body Clamp Bolt	21	2.1	15	
Muffler Body End Cover Bolts	9.8	1.0	87 in·lb	
Premuffler Chamber Guard Bolts	9.8	1.0	87 in·lb	S
Clutch				
Clutch Lever Assembly Clamp Bolts	7.8	0.80	69 in·lb	S
Clutch Cover Bolts	9.8	1.0	87 in·lb	
Oil Filler Plug	–	–	–	Hand-tighten
Clutch Spring Bolts	9.0	0.92	80 in·lb	
Clutch Hub Nut	135	13.8	100	R
Engine Lubrication System				
Oil Filler Plug	–	–	–	Hand-tighten
Oil Cooler Bolts	12	1.2	106 in·lb	
Oil Passage Plugs	20	2.0	15	L
Radiator (Water) Hose Clamp Screws	3.0	0.31	27 in·lb	
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·lb	
Oil Pressure Relief Valve	15	1.5	11	L
Oil Filter	17	1.7	13	G, R
Oil Filter Pipe	25	2.5	18	L
Oil Pan Bolts	12	1.2	106 in·lb	S
Engine Oil Drain Bolt	29	3.0	21	
Lower Fairing Bracket Bolts	12	1.2	106 in·lb	
Engine Removal/Installation				
Upper Engine Bracket Bolts (M10)	59	6.0	44	S
Upper Engine Bracket Bolt (M8)	27	2.8	20	S
Lower Engine Bracket Bolts	59	6.0	44	S
Upper Adjusting Collar	9.8	1.0	87 in·lb	S
Upper Engine Mounting Bolt (L = 65)	44	4.5	32	S
Upper Adjusting Collar Locknut	49	5.0	36	S
Upper Engine Mounting Bolt (L = 54)	44	4.5	32	S
Rear Engine Bracket Bolts	59	6.0	44	S
Middle Engine Bracket Bolts	25	2.5	18	L, S

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Middle Engine Mounting Nut	44	4.5	32	S
Lower Engine Mounting Nut	44	4.5	32	S
Lower Adjusting Collar Locknut	49	5.0	36	S
Lower Adjusting Collar	9.8	1.0	87 in·lb	S
Crankshaft/Transmission				
Balancer Shaft Clamp Bolt	9.8	1.0	87 in·lb	
Balancer Shaft Lever Bolt	25	2.5	18	L
Breather Side Plate Bolt	5.9	0.60	52 in·lb	L
Connecting Rod Big End Nuts	see the text	←	←	MO
Breather Plate Bolts	9.8	1.0	87 in·lb	L
Shift Drum Bearing Holder Bolts	12	1.2	106 in·lb	L
Oil Passage Plugs	20	2.0	15	L
Oil Passage Plug	9.8	1.0	87 in·lb	
Starter Motor Clutch Bolts	12	1.2	106 in·lb	L
Crankcase Bolts (M7)	20	2.0	15	S
Crankcase Bolts (M9)	42	4.3	31	S, MO
Crankcase Bolts (M6)	12	1.2	106 in·lb	S
Crankcase Bolts (M8)	27	2.8	20	S
Gear Positioning Lever Bolt	12	1.2	106 in·lb	
Shift Drum Cam Bolt	12	1.2	106 in·lb	L
Neutral Switch	15	1.5	11	
Shift Shaft Return Spring Pin	39	4.0	29	L
Shift Pedal Mounting Bolt	25	2.5	18	
Wheels/Tires				
Front Axle Clamp Bolt	20	2.0	15	
Front Axle	127	13.0	93.7	
Rear Sprocket Nuts	59	6.0	44	R
Rear Axle Nut	108	11.0	79.7	
Final Drive				
Engine Sprocket Nut	125	12.7	92.2	MO
Drive Chain Guide Bolts	9.8	1.0	87 in·lb	
Rear Sprocket Nuts	59	6.0	44	R
Rear Axle Nut	108	11.0	79.7	
Brakes				
Front Master Cylinder Reservoir Cap Screws	1.5	0.15	13 in·lb	
Brake Lever Pivot Bolt	1.0	0.10	8.9 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Front Master Cylinder Clamp Bolts	11	1.1	97 in·lb	S
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Brake Hose Banjo Bolts	25	2.5	18	
Brake Pipe Joint Nuts	18	1.8	13	
ABS Hydraulic Unit Bracket Bolts	8.8	0.90	78 in·lb	L

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Front Brake Disc Mounting Bolts	27	2.8	20	L
Front Brake Pad Spring Bolts	2.9	0.30	26 in·lb	
Bleed Valve	7.8	0.80	69 in·lb	
Front Caliper Assembly Bolts	22	2.2	16	
Front Brake Pad Pin	15	1.5	11	
Front Caliper Mounting Bolts	25	2.5	18	
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Brake Pedal Bolt	8.8	0.90	78 in·lb	
Rear Master Cylinder Push Rod Locknut	17	1.7	13	
Rear Caliper Pin Bolt	27	2.8	20	Si
Rear Brake Pad Pin Plug	2.5	0.25	22 in·lb	
Rear Brake Pad Pin	17	1.7	13	
Rear Caliper Mounting Bolt	22	2.2	16	
Rear Brake Disc Mounting Bolts	27	2.8	20	L
Suspension				
Upper Front Fork Clamp Bolts	20	2.0	15	
Lower Front Fork Clamp Bolts	20.5	2.09	15.1	AL
Front Fork Top Plugs	22.5	2.29	16.6	
Piston Rod Nuts	15	1.5	11	
Cylinder Units	60	6.1	44	AD
Front Axle Clump Bolt	20	2.0	15	
Rear Shock Absorber Bolt (Upper)	34	3.5	25	
Swingarm Pivot Adjusting Collar Locknut	98	10	72	
Swingarm Pivot Shaft	20	2.0	15	
Swingarm Pivot Shaft Nut	108	11.0	79.7	
Swingarm Pivot Adjusting Collar	20	2.0	15	
Tie-rod Nuts	34	3.5	25	R
Rear Shock Absorber Nut (Lower)	34	3.5	25	R
Rocker Arm Nut	34	3.5	25	R
Steering				
Handlebar Holder Bolts	25	2.5	18	
Switch Housing Screws	3.5	0.36	31 in·lb	
Steering Stem Head Bolt	108	11.0	79.7	
Upper Front Fork Clamp Bolts	20	2.0	15	
Handlebar Holder Mounting Nuts	34	3.5	25	R
Steering Stem Nut	25	2.5	18	
Lower Front Fork Clamp Bolts	20.5	2.09	15.1	AL
Frame				
Front Fender Mounting Bolts	3.9	0.40	35 in·lb	
Rear Frame Bolts	44	4.5	32	
Front Footpeg Bracket Bolts	25	2.5	18	
Sidestand Bracket Bolts	49	5.0	36	L
Sidestand Nut	44	4.5	32	R, S

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Sidestand Bolt	29	3.0	21	S
Sidestand Switch Bolt	8.8	0.90	78 in·lb	L
Carrier Bracket Bolts	34	3.5	25	L
Carrier Mounting Bolts	8.8	0.90	78 in·lb	L
Rear Frame Guard Bolts	8.8	0.90	78 in·lb	
Rear Footpeg Bracket Bolts (Lower)	28	2.9	21	L
Rear Footpeg Bracket Nuts	25	2.5	18	R
Electrical System				
Switch Housing Screws	3.5	0.36	31 in·lb	
Oxygen Sensor	44	4.5	32	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Licence Plate Light Mounting Screws	0.9	0.09	8 in·lb	
Intake Air Temperature Sensor Mounting Screw	1.2	0.12	11 in·ib	
Spark Plugs	9.8	1.0	87 in·lb	
Crankshaft Sensor Cover Bolts	12	1.2	106 in·lb	
Water Temperature Sensor	12	1.2	106 in·lb	
Timing Rotor Bolt	39	4.0	29	
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Starter Motor Cable Terminal Nut	5.9	0.60	52 in·lb	
Starter Motor Terminal Locknut	11	1.1	97 in·lb	
Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	
Alternator Rotor Bolt	155	15.8	114	
Stator Coil Bolts	12	1.2	106 in·ib	L
Starter Motor Through Bolts	5.0	0.51	44 in·lb	
Brush Holder Screw	3.8	0.39	34 in·ib	
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·ib	
Alternator Cover Bolts	12	1.2	106 in·lb	
Alternator Lead Holding Plate Bolt	12	1.2	106 in·ib	L
Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
Neutral Switch	15	1.5	11	
Sidestand Switch Bolt	8.8	0.90	78 in·lb	L

Torque and Locking Agent

The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

Basic Torque for General Fasteners

Threads Diameter (mm)	Torque		
	N·m	kgf·m	ft·lb
5	3.4 ~ 4.9	0.35 ~ 0.50	30 ~ 43 in·lb
6	5.9 ~ 7.8	0.60 ~ 0.80	52 ~ 69 in·lb
8	14 ~ 19	1.4 ~ 1.9	10.0 ~ 13.5
10	25 ~ 34	2.6 ~ 3.5	19.0 ~ 25
12	44 ~ 61	4.5 ~ 6.2	33 ~ 45
14	73 ~ 98	7.4 ~ 10.0	54 ~ 72
16	115 ~ 155	11.5 ~ 16.0	83 ~ 115
18	165 ~ 225	17.0 ~ 23.0	125 ~ 165
20	225 ~ 325	23.0 ~ 33.0	165 ~ 240

Specifications

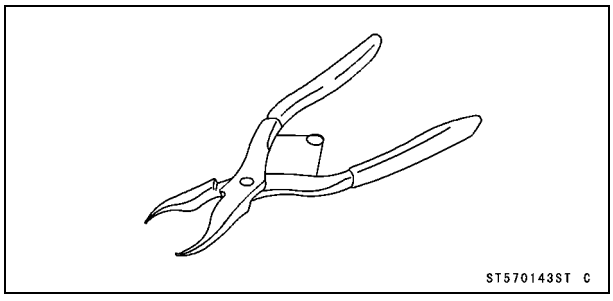
Item	Standard	Service Limit
Fuel System (DFI)		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Idle Speed	1 100 ±50 r/min (rpm)	– – –
Bypass Screws (Turn Out)	2 1/2 (for reference)	– – –
Throttle Body Vacuum	40.7 ±1.3 kPa (305 ±10 mmHg) at idle speed	– – –
Air Cleaner Element	Viscous paper element	– – –
Cooling System		
Coolant:		
Type (Recommended)	Permanent type of antifreeze	– – –
Color	Green	– – –
Mixed Ratio	Soft water 50%, Coolant 50%	– – –
Freezing Point	–35°C (–31°F)	– – –
Total Amount	2.6 L (2.7 US qt)	– – –
Engine Top End		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	– – –
Intake	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	– – –
Clutch		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Engine Lubrication System		
Engine Oil:		
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2	– – –
Viscosity	SAE 10W-40	– – –
Capacity	3.2 L (3.4 US qt) (when filter is not removed)	– – –
	3.8 L (4.0 US qt) (when filter is removed)	– – –
	4.0 L (4.2 US qt) (when engine is completely dry)	– – –
Wheels/Tires		
Tread Depth:		
Front	4.4 mm (0.17 in.)	1 mm (0.04 in.), (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	6.6 mm (0.26 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.), Over 130 km/h (80 mph): 3 mm (0.12 in.)
Air Pressure (when Cold):		
Front	Up to 220 kg (485 lb) load: 250 kPa (2.5 kgf/cm², 36 psi)	– – –
Rear	Up to 220 kg (485 lb) load: 290 kPa (2.9 kgf/cm², 42 psi)	– – –
Final Drive		
Drive Chain Slack	25 ~ 35 mm (1.0 ~ 1.4 in.)	– – –

Specifications

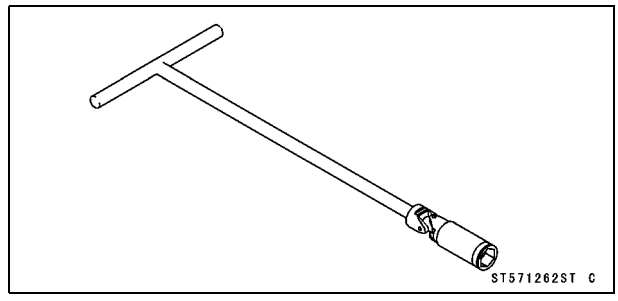
Item	Standard	Service Limit
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	319 mm (12.6 in.)
Standard Chain:		
Make	ENUMA	– – –
Type	EK525RMX	– – –
Link	116 Links	– – –
Brakes		
Brake Fluid:		
Grade	DOT4	– – –
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Light Timing:		
Front	Pulled ON	– – –
Rear	ON after about 10 mm (0.39 in.) of pedal travel	– – –
Electrical System		
Spark Plug:		
Type	NGK CR9EIA-9	– – –

Special Tools

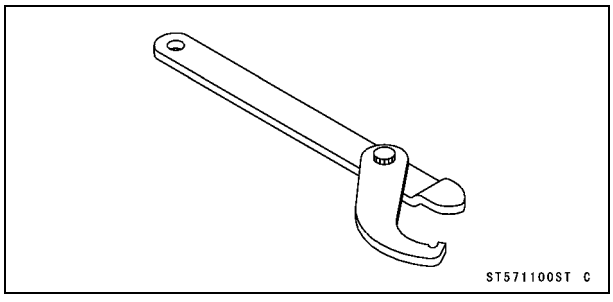
Inside Circlip Pliers:
57001-143



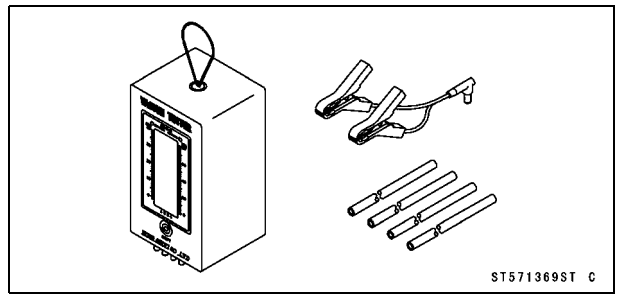
Spark Plug Wrench, Hex 16:
57001-1262



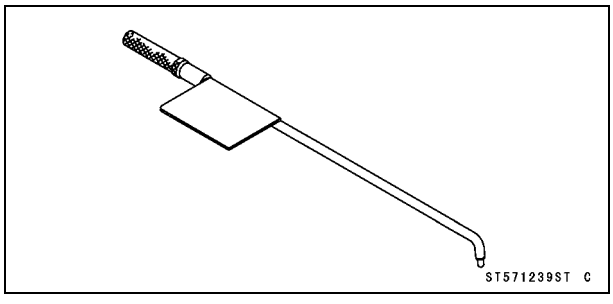
Steering Stem Nut Wrench:
57001-1100



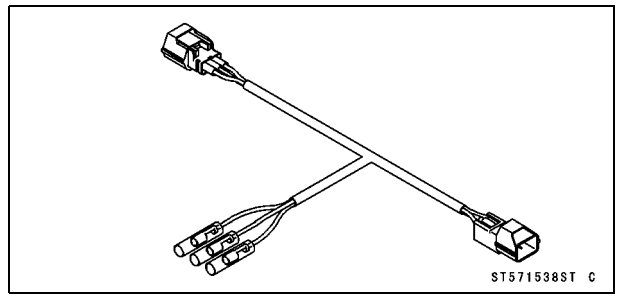
Vacuum Gauge:
57001-1369



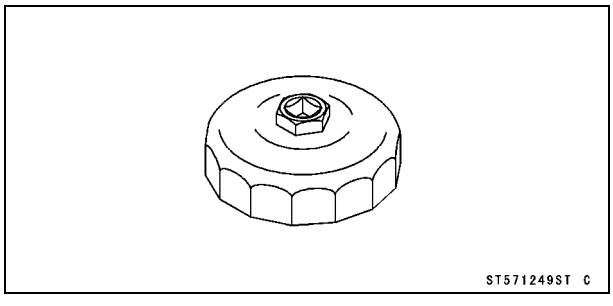
Pilot Screw Adjuster, A:
57001-1239



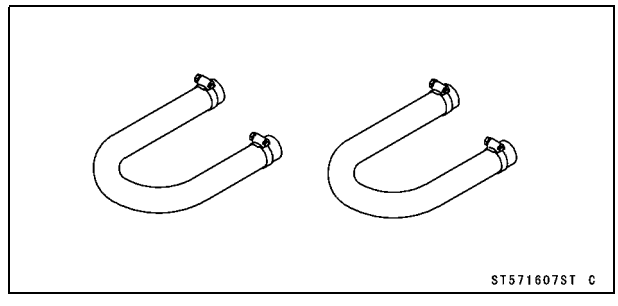
Throttle Sensor Setting Adapter:
57001-1538



Oil Filter Wrench:
57001-1249



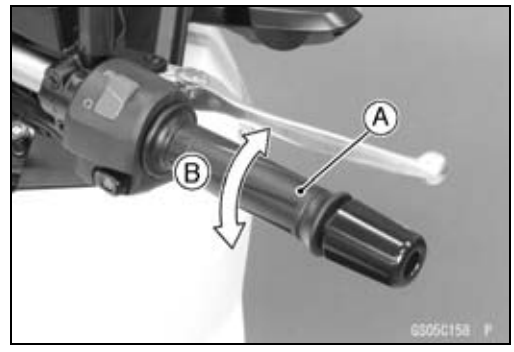
Fuel Hose:
57001-1607



Periodic Maintenance Procedures

Fuel System (DFI)

Throttle Control System Inspection

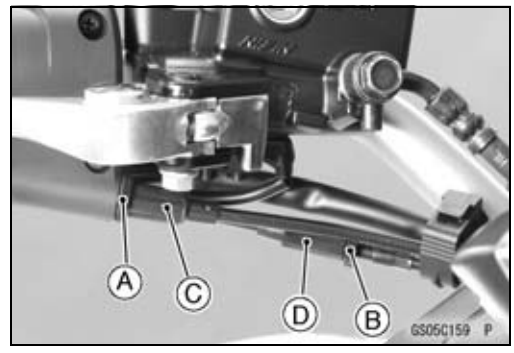


- Check that the throttle grip [A] moves smoothly from full open to close, and the throttle closes quickly and completely by the return spring in all steering positions.

★If the throttle grip does not return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.

- Check the throttle grip free play [B].

Throttle Grip Free Play
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)



★If the free play is incorrect, adjust the throttle cable as follows.

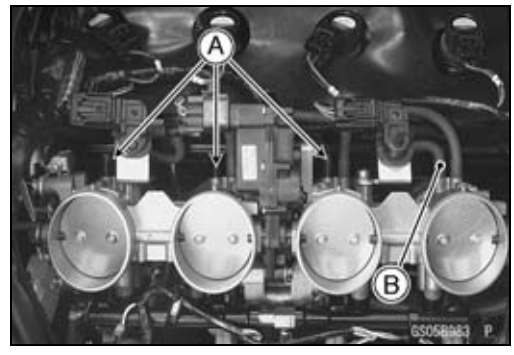
- Loosen the locknuts [A] [B].
- Screw both throttle cable adjusters [C] [D] to give the throttle grip plenty of play.
- Turn the decelerator cable adjuster [C] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [A].
- Turn the accelerator cable adjuster [D] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [B].

★If the free play can not be adjusted with the adjusters, replace the cable.

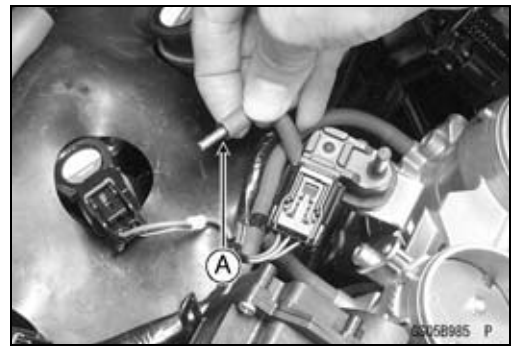
Engine Vacuum Synchronization Inspection

NOTE

○*These procedures are explained on the assumption that the intake and exhaust systems of the engine are in good condition.*



- Situate the motorcycle so that it is vertical.
- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Pull off the rubber caps [A] and vacuum hose [B] from the fittings of each throttle body.



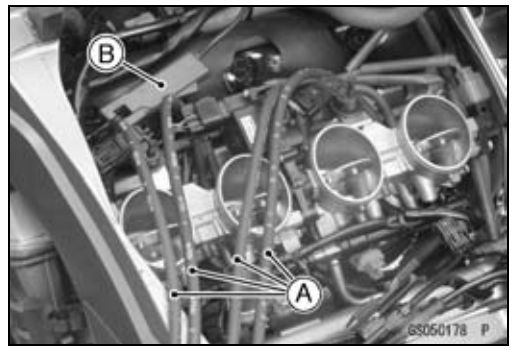
- Plug the vacuum hose end [A].

Periodic Maintenance Procedures

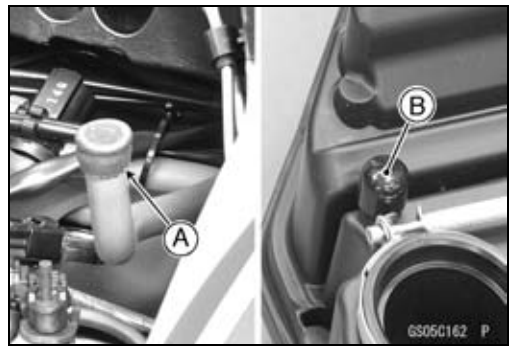
- Connect a vacuum gauge (special tool) and hoses [A] to the fittings on the throttle body.

Special Tool - Vacuum Gauge: 57001-1369

- Connect a highly accurate tachometer [B] to one of the stick coil primary leads.

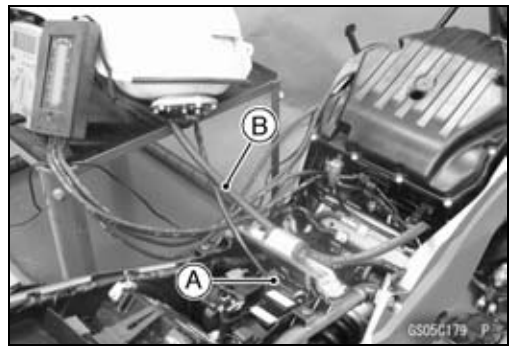


- Plug the air switching valve hose end [A] and air cleaner housing fitting [B].
- Install the air cleaner housing (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter).



- Remove the fuel hose (see Fuel Hose Replacement).
- Connect the following parts temporary.
  Fuel Pump Lead Connector [A]
  Fuel Hose [B]

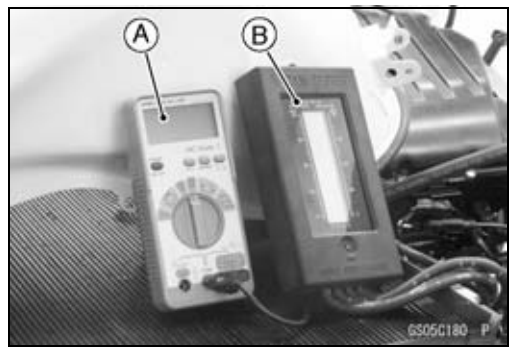
Special Tool - Fuel Hose: 57001-1607



- Start the engine and warm it up thoroughly.
- Check the idle speed, using a highly accurate tachometer [A].

Idle Speed
Standard: 1 100 ±50 r/min (rpm)

★If the idle speed is out of the specified range, adjust it with the adjusting screw (see Idle Speed Adjustment).



NOTICE

Do not measure the idle speed by the tachometer of the meter unit.

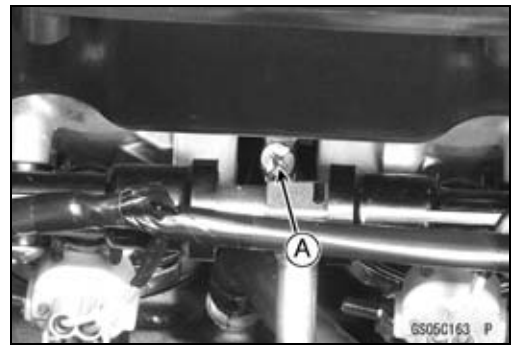
- While idling the engine, inspect the throttle body vacuum, using the vacuum gauge [B].

Throttle Body Vacuum
Standard: 40.7 ±1.3 kPa (305 ±10 mmHg) at idle speed

Periodic Maintenance Procedures

★If any vacuum is not within specifications, first synchronize the balance of the left (#1, #2 throttle valves) and right (#3, #4 throttle valves) assemblies.

Example:
#1: 260 mmHg
#2: 300 mmHg
#3: 250 mmHg
#4: 280 mmHg



- With the engine at the correct idle speed, equalize higher vacuum of #1 or #2 (for example 300 mmHg) to higher vacuum of #3 or #4 (for example 280 mmHg) by turning the center adjusting screw [A].

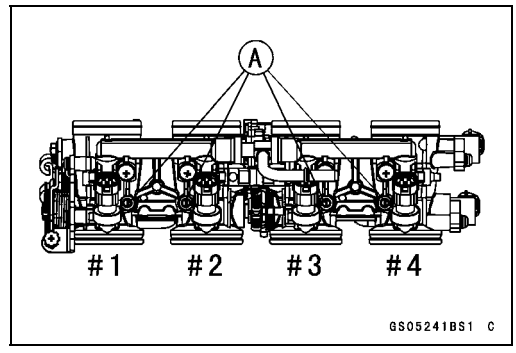
NOTE

○*After adjustment, the final vacuum measurement between the highest throttle valves may not be 300 mmHg (for example). The goal is to have the highest two vacuums between the left (#1 and #2) and right (#3 and #4) banks be the same.*

- Open and close the throttle after each measurement, and adjust the idle speed as necessary.
- Once the throttle valves have been synchronized, inspect output voltage of the main throttle sensor to ensure proper operation (procedure is explained at the end of this section).

★If any one vacuum measurement is out of the specified range after left (#1, #2) and right (#3, #4) synchronization, adjust the bypass screws [A].

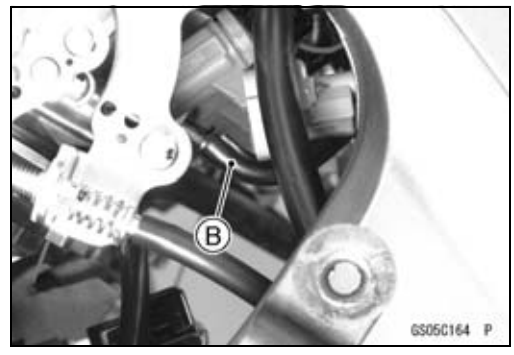
Special Tool - Pilot Screw Adjuster, A [B]: 57001-1239



- Adjust the lower vacuum between #1 and #2 to the higher vacuum of #1 and #2.
- Adjust the lower vacuum between #3 and #4 to the higher vacuum of #3 and #4.
- Open and close the throttle valves after each measurement, and adjust the idle speed as necessary.
- Check the vacuums as before.

★If all vacuums are within the specification range, finish the engine vacuum synchronization.

★If any vacuum can not be adjusted within the specification, remove the bypass screws #1 ~ #4 and clean them.

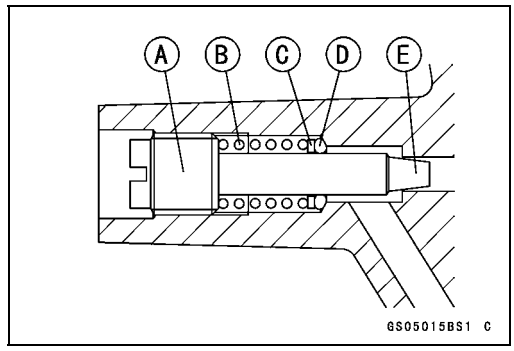


Periodic Maintenance Procedures

● Turn in the bypass screw [A] with counting the number of turns until it seals fully but not tightly. Record the number of turns.

NOTICE

Do not over tighten them. They could be damaged, requiring replacement.



● Remove:
Bypass Screw
Spring [B]
Washer [C]
O-ring [D]
● Check the bypass screw and its hole for carbon deposits.
★If any carbons accumulate, wipe the carbons off from the bypass screw and the hole, using a cotton pad penetrated with a high flash-point solvent.
● Replace the O-ring with a new one.
○Apply grease to the O-ring.
● Check the tapered portion [E] of the bypass screw for wear or damage.
★If the bypass screw is worn or damaged, replace it.
● Turn in the bypass screw until it seats fully but not tightly.

● Back out the same number of turns counted when first turned in. This is to set the screw to its original position.

NOTE

○*A throttle body has different "turns out" of the bypass screw for each individual unit. On setting the bypass screw, use the "turns out" determined during disassembly.*

● Repeat the same procedure for other bypass screws.
● Repeat the synchronization.
★If the vacuums are correct, check the output voltage of the main throttle sensor (see Main Throttle Sensor Output Voltage Inspection in the Fuel System (DFI) chapter).

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

Main Throttle Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → W (sensor Y/W) lead
Digital Meter (–) → BK (sensor G) lead

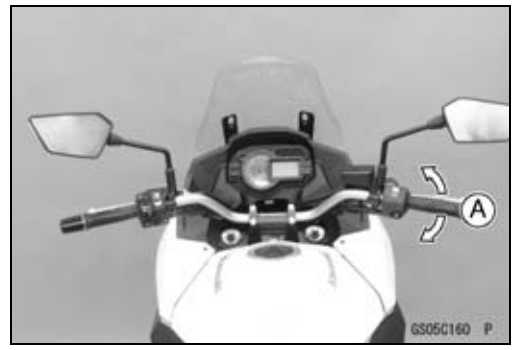
Standard: DC 1.02 ~ 1.06 V at idle throttle opening

★If the output voltage is out of the standard, check the input voltage of the main throttle sensor (see Main Throttle Sensor Input Voltage Inspection in the Fuel System (DFI) chapter).

● Remove the vacuum gauge hoses and install the rubber caps on the original position.

Periodic Maintenance Procedures

Idle Speed Inspection



- Start the engine and warm it up thoroughly.
- With the engine idling, turn the handlebars to both sides [A].

★If handlebars movement changes the idle speed, the throttle cables may be improperly adjusted or incorrectly routed or damaged. Be sure to correct any of these conditions before riding (see Throttle Control System Inspection and Cable, Wire, and Hose Routing section in the Appendix chapter).

⚠ WARNING

Operation with improperly adjusted, incorrectly routed or damaged cables could result in an unsafe riding condition. Follow the service manual to be make sure to correct any of these conditions.

- Check the idle speed.

Idle Speed
Standard: 1 100 ±50 r/min (rpm)

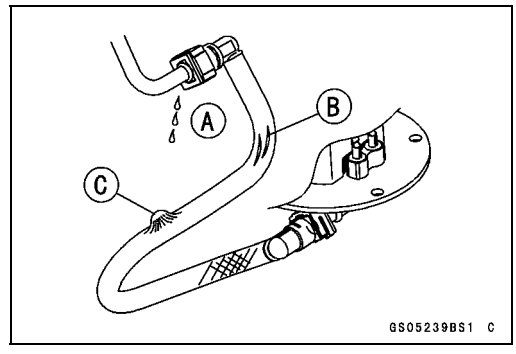
★If the idle speed is out of the specified range, adjust it.

Idle Speed Adjustment

- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.

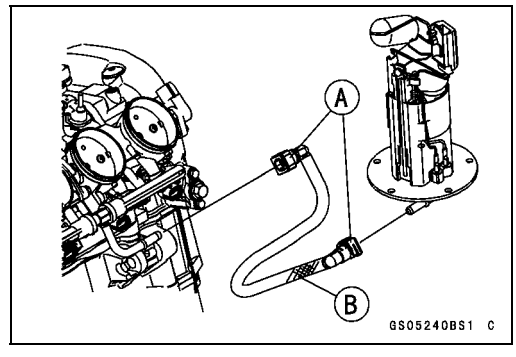
○Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.

Fuel Hose Inspection (fuel leak, damage, installation condition)



○If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose to burst. Support the fuel tank with a suitable bar (see Fuel Hose Replacement) and check the fuel hoses.

★Replace the hose if any fraying, cracks [B] or bulges [C] are noticed.



- Check that the hoses are routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.

★Replace the hose if it has been sharply bent or kinked.
Hose Joints [A]
Fuel Hose [B]

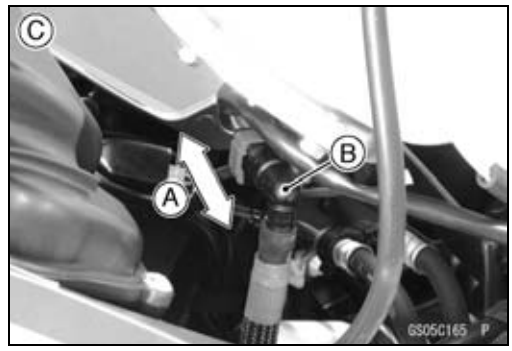
Periodic Maintenance Procedures

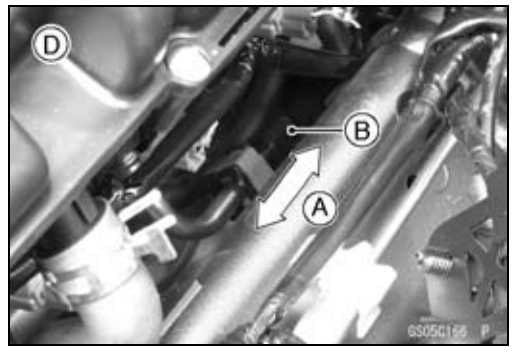
● Check that the hose joints are securely connected.
○Push and pull [A] the hose joint [B] back and forth more than two times, and make sure it is locked and does not come off.
Fuel Pump Side [C]
Throttle Body Assy Side [D]

⚠ WARNING

Leaking fuel can cause a fire or explosion resulting in serious burns. Make sure the hose joint is installed correctly on the delivery pipe.

★If it comes off, reinstall the hose joint.





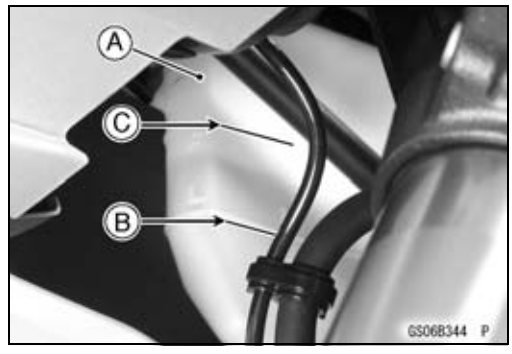
Cooling System

Coolant Level Inspection

NOTE

○*Check the level when the engine is cold (room or ambient temperature).*

● Check the coolant level in the reserve tank [A] with the motorcycle held perpendicular (Do not use the sidestand.).
★If the coolant level is lower than the “L” level line [B], unscrew the reserve tank cap and add coolant to the “F” level line [C].
“L”: low
“F”: full

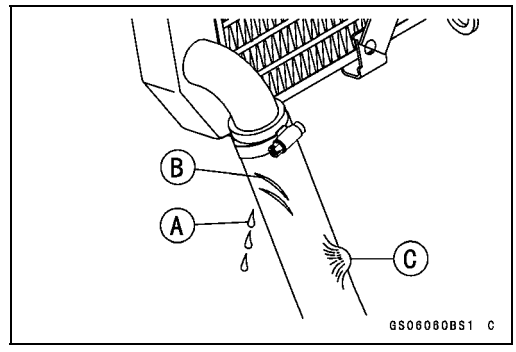


NOTICE

For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water alone can be added. But the diluted coolant must be returned to the correct mixture ratio within a few days.
If coolant must be added often or the reservoir tank has run completely dry, there is probably leakage in the cooling system. Check the system for leaks.
Coolant ruins painted surfaces. Immediately wash away any coolant that spills on the frame, engine, wheels or other painted parts.

Periodic Maintenance Procedures

Radiator Hose and Pipe Inspection (coolant leak, damage, installation condition)



○The high pressure inside the radiator hose can cause coolant to leak [A] or the hose to burst if the line is not properly maintained.

● Visually inspect the hoses for signs of deterioration. Squeeze the hoses. A hose should not be hard and brittle, nor should it be soft or swollen.

★Replace the hose if any fraying, cracks [B] or bulges [C] are noticed.

● Check that the hoses are securely connected and clamps are tightened correctly.

Torque - Radiator (Water) Hose Clamp Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)

Engine Top End

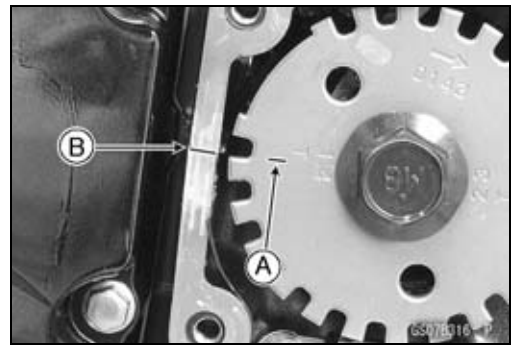
Valve Clearance Inspection

NOTE

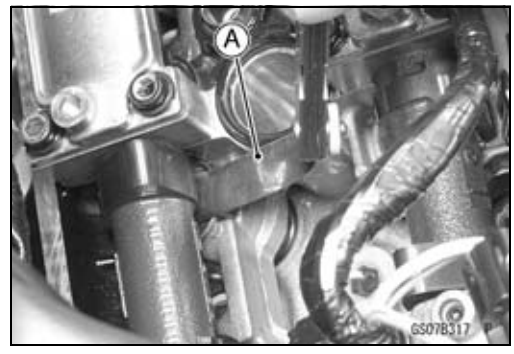
○*Valve clearance must be checked and adjusted when the engine is cold (room temperature).*

● Remove:
Crankshaft Sensor Cover (see Crankshaft Sensor Removal in the Electrical System chapter)
Cylinder Head Cover (see Cylinder Head Cover Removal in the Engine Top End chapter)

● Turn the crankshaft, align the #1, 4 mark on the timing rotor with the crankcase timing mark.
TDC Mark [A] for #1, 4 Pistons
Timing Mark [B] (Crankcase Halves Mating Surface)



● Using the thickness gauge [A], measure the valve clearance between the cam and the valve lifter.



Valve Clearance
Standard:

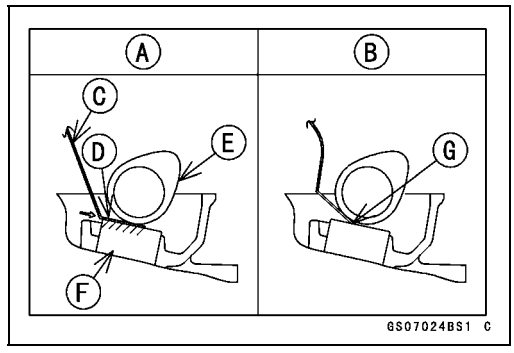
Exhaust	**0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)**
Intake	**0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)**

Periodic Maintenance Procedures

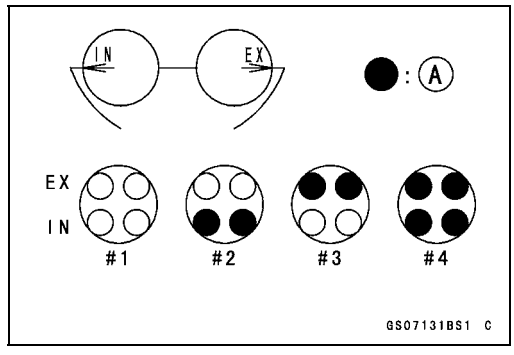
NOTE

○*Thickness gauge is horizontally inserted on the valve lifter.*

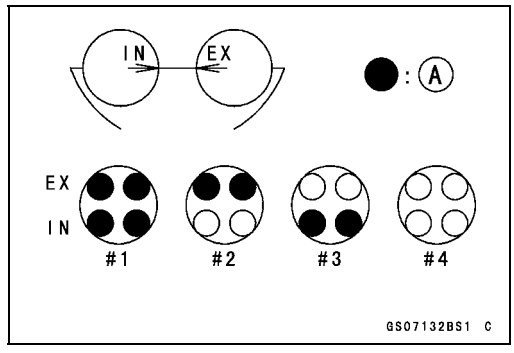
Appropriateness [A]
Inadequacy [B]
Thickness Gauge [C]
Horizontally Inserts [D]
Cam [E]
Valve Lifter [F]
Hits the Valve Lifter Ahead [G]



○**When positioning #4 piston TDC at the end of the compression stroke:**
Intake Valve Clearance of #2 and #4 Cylinders
Exhaust Valve Clearance of #3 and #4 Cylinders
Measuring Valve [A]



○**When positioning #1 piston TDC at the end of the compression stroke:**
Intake Valve Clearance of #1 and #3 Cylinders
Exhaust Valve Clearance of #1 and #2 Cylinders
Measuring Valve [A]



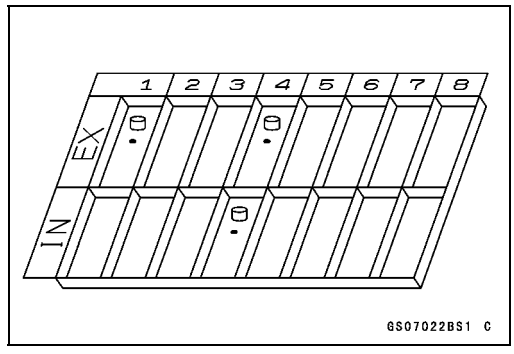
★If the valve clearance is not within the specified range, first record the clearance, and then adjust it.

Valve Clearance Adjustment

● To change the valve clearance, remove the camshaft chain tensioner, camshafts and valve lifters. Replace the shim with one of a different thickness.

NOTE

○*Mark and record the locations of the valve lifters and shims so that they can be reinstalled in their original positions.*



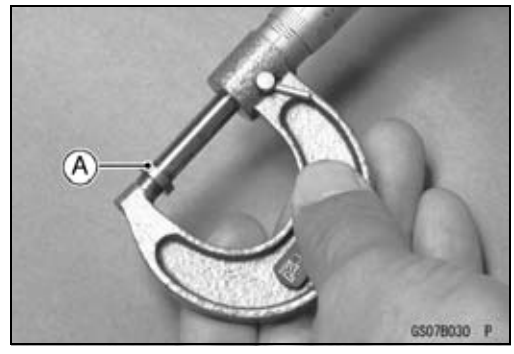
Periodic Maintenance Procedures

○Besides the standard shims in the valve clearance adjustment charts, the following shims may be installed at the factory. Although they are not available as spare parts, they can be used to adjust valve clearance.

Adjustment Shims

Thickness
3.225 mm
3.275 mm
3.325 mm
2.675 mm
2.725 mm
2.775 mm
2.825 mm
2.875 mm
2.925 mm
2.975 mm
3.025 mm
3.075 mm
3.125 mm
3.175 mm

- Clean the shim to remove any dust or oil.
- Measure the thickness of the removed shim [A].



Periodic Maintenance Procedures

VALVE CLEARANCE ADJUSTMENT CHART INTAKE VALVE

	PRESENT SHIM (Example)																					
PART No. (92180-)	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054
MARK	50	55	60	65	70	75	80	85	90	95	00	05	10	15	20	25	30	35	40	45	50
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
0.00~0.02	–	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30
0.03~0.07	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35
0.08~0.12	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.13~0.14	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.15~0.24	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																				
0.25~0.27	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
0.28~0.32	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
0.33~0.37	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50			
0.38~0.42	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50				
0.43~0.47	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50					
0.48~0.52	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50						
0.53~0.57	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50							
0.58~0.62	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50								
0.63~0.67	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50									
0.68~0.72	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50										
0.73~0.77	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50											
0.78~0.82	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50												
0.83~0.87	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50													
0.88~0.92	3.20	3.25	3.30	3.35	3.40	3.45	3.50														
0.93~0.97	3.25	3.30	3.35	3.40	3.45	3.50															
0.98~1.02	3.30	3.35	3.40	3.45	3.50																
1.03~1.07	3.35	3.40	3.45	3.50																	
1.08~1.12	3.40	3.45	3.50																		
1.13~1.17	3.45	3.50																			
1.18~1.22	3.50																				

VALVE CLEARANCE MEASUREMENT (Example)

INSTALL THE SHIM OF THIS THICKNESS (mm)

GS07122BW3 C

1. Measure the clearance (when engine is cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. Install the shim specified where the lines intersect. This shim will give the proper clearance.

Example: Present shim is **2.95 mm**
Measured clearance is **0.45 mm**
Replace **2.95 mm** shim with **3.20 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

Periodic Maintenance Procedures

VALVE CLEARANCE ADJUSTMENT CHART EXHAUST VALVE

	PRESENT SHIM									↓Example											
PART No. (92180-)	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054
MARK	50	55	60	65	70	75	80	85	90	95	00	05	10	15	20	25	30	35	40	45	50
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
VALVE CLEARANCE MEASUREMENT																					
0.00~0.04	–	–	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25
0.05~0.09	–	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30
0.10~0.14	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35
0.15~0.19	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.20~0.21	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.22~0.31	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																				
0.32~0.34	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
0.35~0.39	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
0.40~0.44	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50			
←Example 0.45~0.49	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50				
0.50~0.54	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50					
0.55~0.59	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50						
0.60~0.64	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50							
0.65~0.69	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50								
0.70~0.74	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50									
0.75~0.79	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50										
0.80~0.84	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50											
0.85~0.89	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50												
0.90~0.94	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50													
0.95~0.99	3.20	3.25	3.30	3.35	3.40	3.45	3.50														
1.00~1.04	3.25	3.30	3.35	3.40	3.45	3.50															
1.05~1.09	3.30	3.35	3.40	3.45	3.50																
1.10~1.14	3.35	3.40	3.45	3.50																	
1.15~1.19	3.40	3.45	3.50																		
1.20~1.24	3.45	3.50																			
1.25~1.29	3.50																				

INSTALL THE SHIM OF THIS THICKNESS (mm)

GS07120BW3 C

1. Measure the clearance (when engine is cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. Install the shim specified where the lines intersect. This shim will give the proper clearance.

Example: Present shim is **2.95 mm.**
Measured clearance is **0.47 mm.**
Replace **2.95 mm** shim with **3.15 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

Periodic Maintenance Procedures

NOTICE

Be sure to remeasure the clearance after selecting a shim according to the table. If the clearance is out of the specified range, use the additional shim.

○If there is no valve clearance, use a shim that is a few sizes smaller, and remeasure the valve clearance.

- When installing the shim, face the marked side toward the valve lifter.

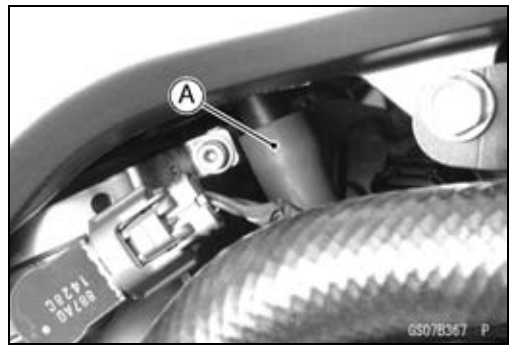
NOTICE

Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.
Do not grind the shim. This may cause it to fracture, causing extensive engine damage.

- Apply engine oil to the valve lifter surface and install the lifter.
- Install the camshaft (see Camshaft Installation in the Engine Top End chapter).
- Recheck the valve clearance and readjust if necessary.
- Install the removed parts (see appropriate chapters).

Air Suction System Damage Inspection

- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Pull the air switching valve hose [A] out of the air cleaner housing.
- Start the engine and run it at idle speed.



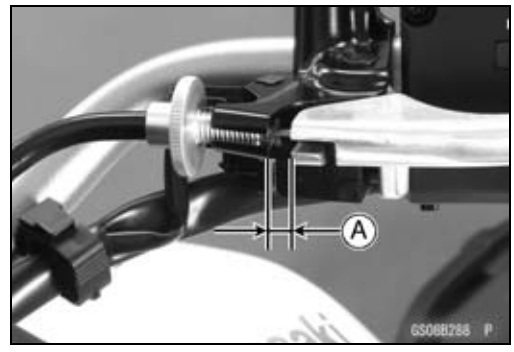
- Plug [A] the air switching valve hose end with your finger and feel vacuum pulsing in the hose.

★If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the air switching valve (see Air Switching Valve Unit Test in the Electrical System chapter) or air suction valve (see Air Suction Valve Inspection in the Engine Top End chapter).

Periodic Maintenance Procedures

Clutch

Clutch Operation Inspection



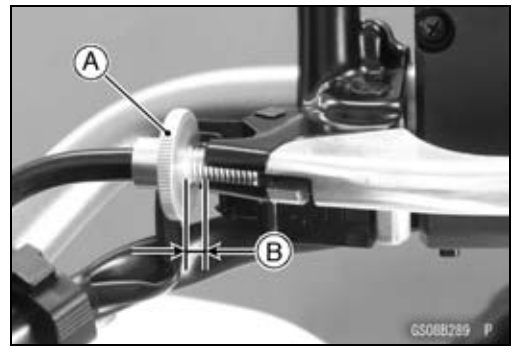
- Pull the clutch lever just enough to take up the free play [A].
- Measure the gap between the lever and the lever holder.

★If the gap is too wide, the clutch may not release fully. If the gap is too narrow, the clutch may not engage fully. In either case, adjust it.

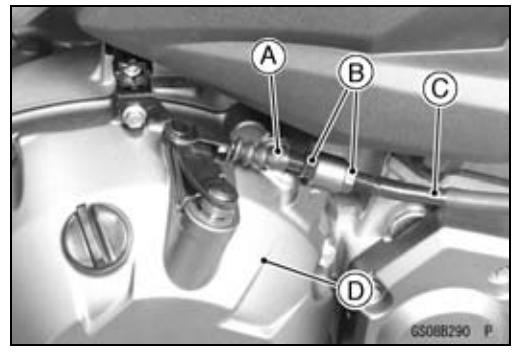
Clutch Lever Free Play
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)

⚠ WARNING

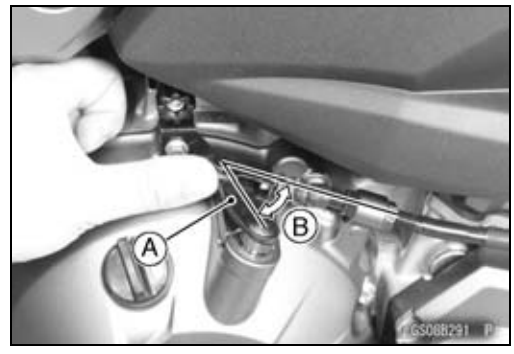
The engine and exhaust system get extremely hot during normal operation and can cause serious burns. Never touch the engine or exhaust pipe during clutch adjustment.



- Turn the adjuster [A] so that 5 ~ 6 mm (0.20 ~ 0.24 in.) [B] of threads are visible.



- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen both adjusting nuts [B] at the clutch cover as far as they will go.
- Pull the clutch outer cable [C] tight and tighten the adjusting nuts against the clutch cover [D].
- Slip the dust cover back onto place.
- Turn the adjuster at the clutch lever until the free play is correct.



- Push the release lever [A] toward the front of the motorcycle until it becomes hard to turn.

○At this time, the release lever should have the proper angle shown.
60° [B]

★If the angle is wrong, check the clutch and release parts for wear.

⚠ WARNING

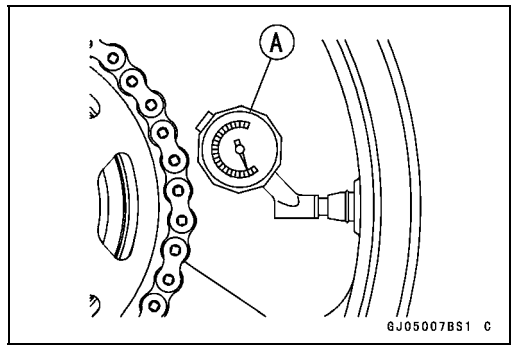
Too much cable play can prevent clutch disengagement and cause an accident resulting in serious injury or death. When adjusting the clutch or replacing the cable, be sure the upper end of the clutch outer cable is fully seated in its fitting, or it could slip into place later, creating enough cable play to prevent clutch disengagement.

- After the adjustment, start the engine and check that the clutch does not slip and that it releases properly.

Periodic Maintenance Procedures

Wheels/Tires

Air Pressure Inspection



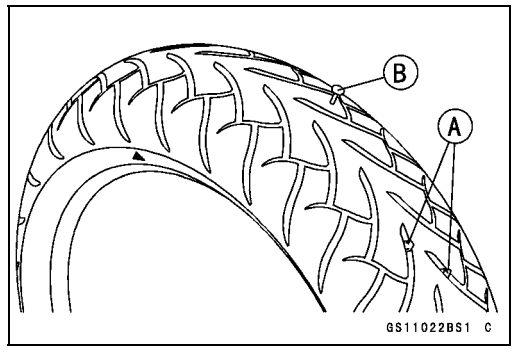
- Remove the air valve cap.
- Measure the tire air pressure with an air pressure gauge [A] when the tires are cold (that is, when the motorcycle has not been ridden more than a mile during the past 3 hours).
- Install the air valve cap.

★Adjust the tire air pressure according to the specifications if necessary.

Air Pressure (when Cold)

Front:	**Up to 220 kg (485 lb)**
	250 kPa (2.5 kgf/cm², 36 psi)
Rear:	**Up to 220 kg (485 lb)**
	290 kPa (2.9 kgf/cm², 42 psi)

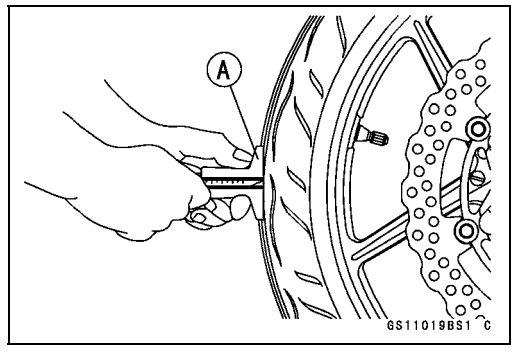
Wheel/Tire Damage Inspection



- Remove any imbedded stones [A] or other foreign particles [B] from tread.
- Visually inspect the tire for cracks and cuts, and replace the tire if necessary. Swelling or high spots indicate internal damage, requiring tire replacement.
- Visually inspect the wheel for cracks, cuts and dents damage.

★If any damage is found, replace the wheel if necessary.

Tire Tread Wear Inspection



As the tire tread wears down, the tire becomes more susceptible to puncture and failure. An accepted estimate is that 90% of all tire failures occur during the last 10% of tread life (90% worn). So it is false economy and unsafe to use the tires until they are bald.

- Measure the tread depth at the center of the tread with a depth gauge [A]. Since the tire may wear unevenly, take measurement at several places.

★If any measurement is less than the service limit, replace the tire (see Tire Removal/Installation in the Wheels/Tires chapter).

Periodic Maintenance Procedures

Tread Depth
Standard:

Front	**4.4 mm (0.17 in.)**
Rear	**6.6 mm (0.26 in.)**

Service Limit:

Front	**1 mm (0.04 in.)**
	(AT, CH, DE) 1.6 mm (0.06 in.)
Rear	**2 mm (0.08 in.)** **Up to 130 km/h (80 mph)**
	3 mm (0.12 in.) **Over 130 km/h (80 mph)**

⚠ WARNING

Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

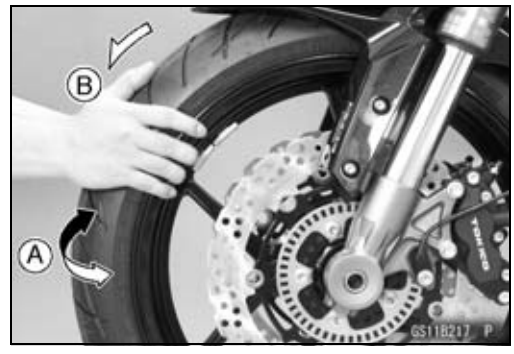
NOTE

○*Most countries may have their own regulations a minimum tire tread depth: be sure to follow them.*
○*Check and balance the wheel when a tire is replaced with a new one.*

Wheel Bearing Damage Inspection

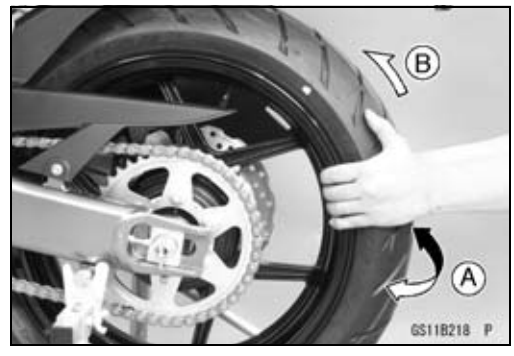
- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheels/Tires chapter).
- Turn the handlebars all the way to the right or left.
- Inspect the roughness of the front wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the front wheel lightly, and check for smoothly turn, roughness, binding or noise.

★If roughness, binding or noise is found, remove the front wheel and inspect the wheel bearing (see Front Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter).



- Raise the rear wheel off the ground with the stand (see Rear Wheel Removal in the Wheels/Tires chapter).
- Inspect the roughness of the rear wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the rear wheel lightly, and check for smoothly turn, roughness, binding or noise.

★If roughness, binding or noise is found, remove the rear wheel and inspect the wheel bearing (see Rear Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter) and coupling (see Coupling Bearing Inspection in the Final Drive chapter).



Periodic Maintenance Procedures

Final Drive

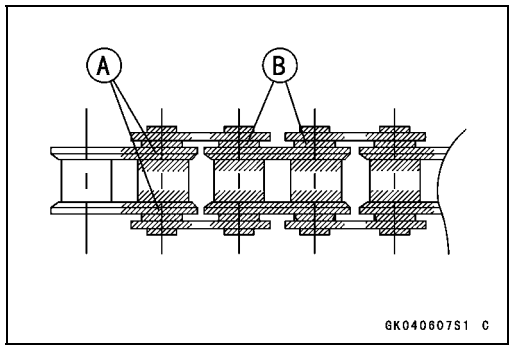
Drive Chain Lubrication Condition Inspection

- If a special lubricant is not available, a heavy oil such as SAE 90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.
- If the chain appears especially dirty, clean it before lubrication.

NOTICE

The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-rings and resultant loss of lubricant, observe the following rules.
Use only kerosene or diesel oil for cleaning of the O -ring of the drive chain. Any other cleaning solution such as gasoline or trichloroethylene will cause deterioration and swelling of the O-ring. Immediately blow the chain dry with compressed air after cleaning. Complete cleaning and drying the chain within 10 minutes.

- Apply oil to the sides of the rollers so that oil will penetrate to the rollers and bushings. Apply the oil to the O-rings so that the O-rings will be coated with oil.
- Wipe off any excess oil.
  Oil Applied Areas [A]
  O-rings [B]



Drive Chain Slack Inspection

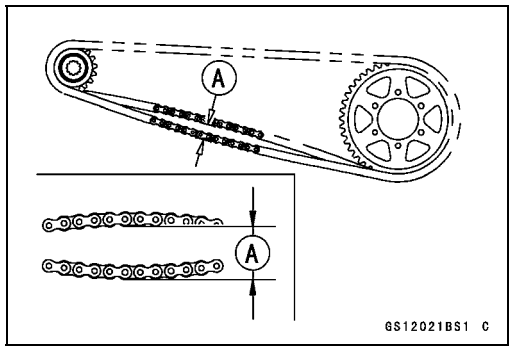
NOTE

○*Check the slack with the motorcycle setting on its sidestand.*
○*Clean the chain if it is dirty, and lubricate it if it appears dry.*

- Check the wheel alignment (see Wheel Alignment Inspection).
- Rotate the rear wheel to find the position where the chain is tightest.
- Measure the vertical movement (chain slack) [A] midway between the sprockets.

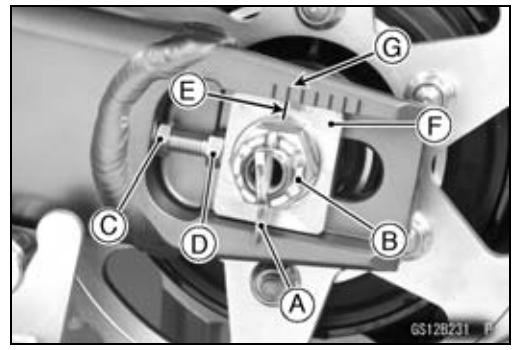
★If the chain slack exceeds the standard, adjust it.

Chain Slack
Standard: 25 ~ 35 mm (1.0 ~ 1.4 in.)



Periodic Maintenance Procedures

Drive Chain Slack Adjustment



- Raise the rear wheel off the ground with the stand.
- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].

★If the chain is too loose, turn out the right and left chain adjusters [D] evenly.

★If the chain is too tight, turn in the right and left chain adjusters evenly, and kick the wheel forward.

- Turn both chain adjusters evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the notch [E] on the left wheel alignment indicator [F] should align with the same swingarm mark or position [G] that the right indicator notch aligns with.

⚠ WARNING

Misalignment of the wheel will result in abnormal wear and may result in an unsafe riding condition. Be sure the wheel is properly aligned.

- Tighten both chain adjuster locknuts securely.
- Tighten the axle nut.

Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.

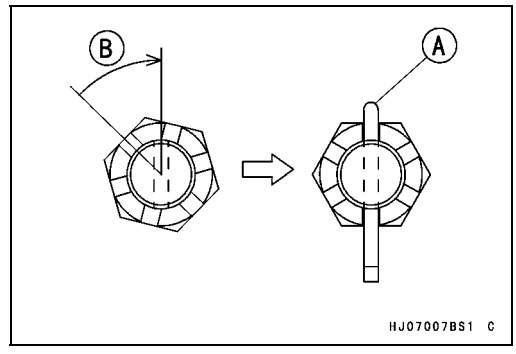
- Insert a new cotter pin [A].

NOTE

○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*

○*It should be within 30 degrees.*

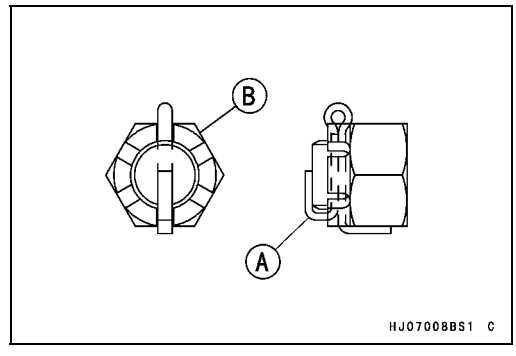
○*Loosen once and tighten again when the slot goes past the nearest hole.*



- Bend the cotter pin [A] over the nut [B].

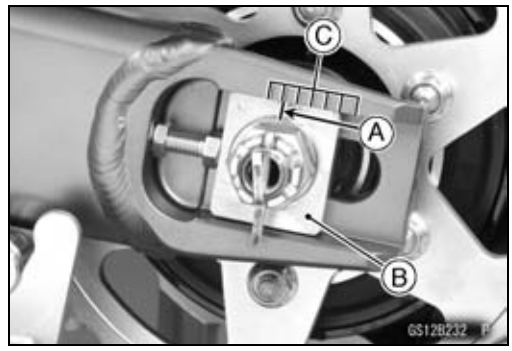
⚠ WARNING

A loose axle nut can lead to an accident resulting in serious injury or death. Tighten the axle nut to the proper torque and install a new cotter pin.



Periodic Maintenance Procedures

Wheel Alignment Inspection



- Check that the notch [A] on the left alignment indicator [B] aligns with the same swingarm mark or position [C] that the right alignment indicator notch aligns with.

★If they are not, adjust the chain slack and align the wheel alignment (see Drive Chain Slack Adjustment).

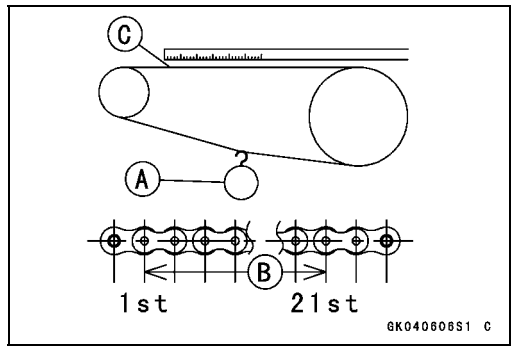
NOTE

○*Wheel alignment can be also checked using the straightedge or string method.*

⚠ WARNING

Misalignment of the wheel will result in abnormal wear and may result in an unsafe riding condition. Be sure the wheel is properly aligned.

Drive Chain Wear Inspection



- Remove the chain cover (see Drive Chain Removal in the Final Drive chapter).
- Rotate the rear wheel to inspect the drive chain for damaged rollers, and loose pins and links.

★If there is any irregularity, replace the drive chain.

★Lubricate the drive chain if it appears dry.

- Stretch the chain taut by hanging a 10 kg (22 lb) weight [A] on the chain.
- Measure the length of 20 links [B] on the straight part [C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.

★If any measurements exceed the service limit, replace the chain. Also, replace the front and rear sprockets when the drive chain is replaced.

Drive Chain 20-link Length

Standard: **317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)**

Service Limit: **319 mm (12.6 in.)**

⚠ WARNING

A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control. Inspect the chain for damage and proper adjustment before each ride. If chain wear exceeds the service limit, replace it with the standard chain.

Standard Chain

Make: **ENUMA**

Type: **EK525RMX**

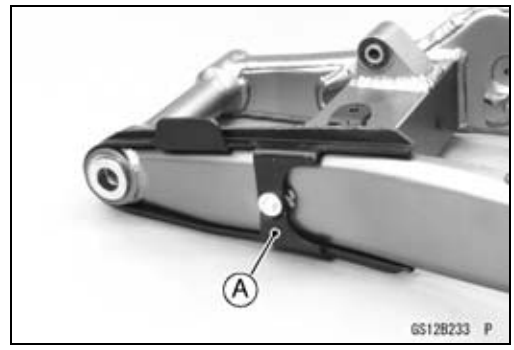
Link: **116 Links**

Periodic Maintenance Procedures

Chain Guide Wear Inspection

- Remove the swingarm (see Swingarm Removal in the Suspension chapter).
- Visually inspect the chain guide [A].

★Replace the chain guide if it shows any signs of abnormal wear or damage.



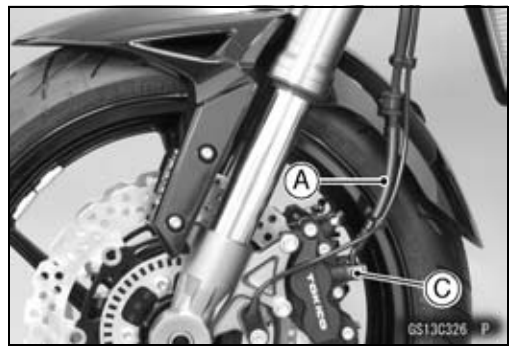
Periodic Maintenance Procedures

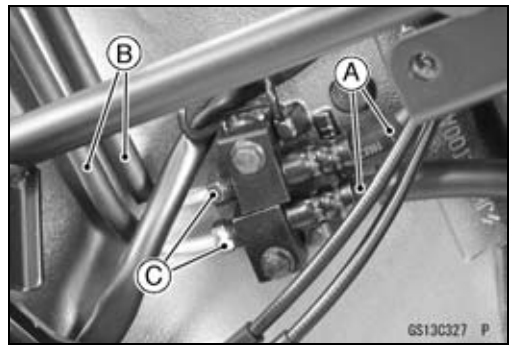
Brakes

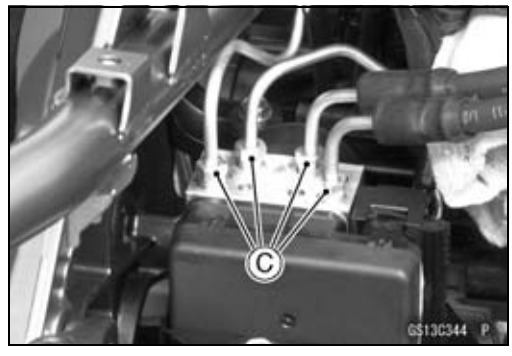
Brake Fluid Leak (Brake Hose and Pipe) Inspection

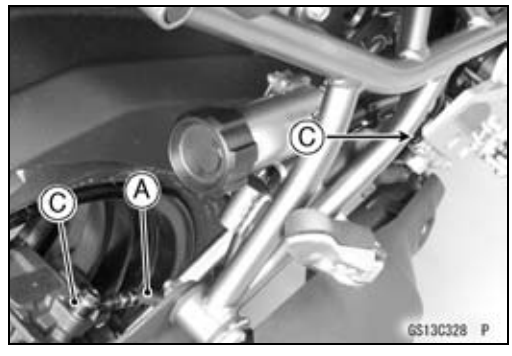
- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Rear Fender (see Flap and Rear Fender Removal in the Frame chapter)
- Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A], pipes [B] and fittings [C].

★If the brake fluid leaked from any position, inspect or replace the problem part.



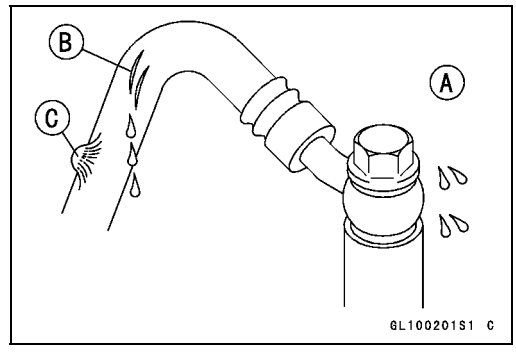






Periodic Maintenance Procedures

Brake Hose and Pipe Damage and Installation Condition Inspection



- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Rear Fender (see Flap and Rear Fender Removal in the Frame chapter)
- Inspect the brake hoses and fittings for deterioration, cracks and signs of leakage.

○The high pressure inside the brake line can cause fluid to leak [A] or the hose, pipe to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.

★Replace the hose and pipe if any crack [B], bulge [C] or leakage is noticed.

★Tighten any brake hose banjo bolts and brake pipe joint nuts.

Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Pipe Joint Nuts: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Inspect the brake hose routing.

★If any brake hose routing is incorrect, route the brake hose according to Cable, Wire, and Hose Routing section in the Appendix chapter.

Brake Operation Inspection

- Inspect the operation of the front and rear brake by running the vehicle on the dry road.

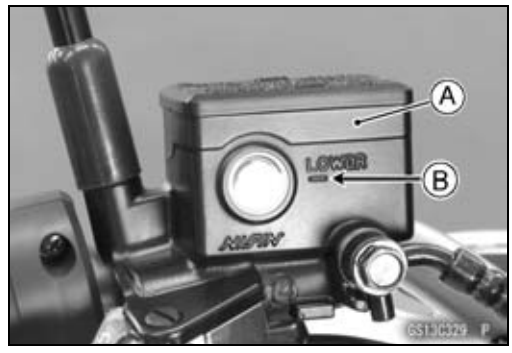
★If the brake operation is insufficiency, inspect the brake system.

⚠ WARNING

When test riding the vehicle, be aware of surrounding traffic for your safety.

Periodic Maintenance Procedures

Brake Fluid Level Inspection

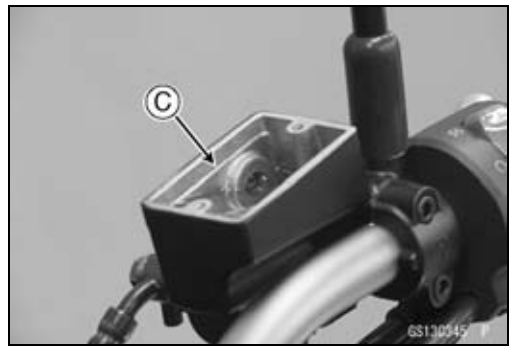


● Check that the brake fluid level in the front brake reservoir [A] is above the lower level line [B].

NOTE

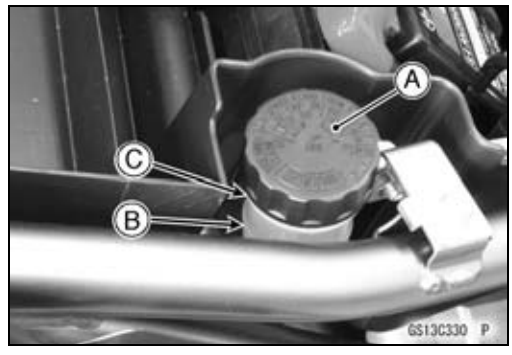
○*Hold the reservoir horizontal by turning the handlebars when checking brake fluid level.*

★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C] in the reservoir.



● Check that the brake fluid level in the rear brake reservoir [A] is above the lower level line [B].

★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C].



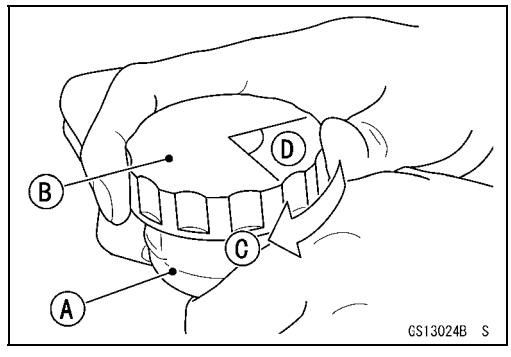
⚠ WARNING

Mixing brands and types of brake fluid can reduce the brake system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that is already in the reservoir are unidentified.

Recommended Disc Brake Fluid
Grade: DOT4

● Follow procedure below to install the front/rear brake fluid reservoir cap correctly.

○First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body, then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body [A].



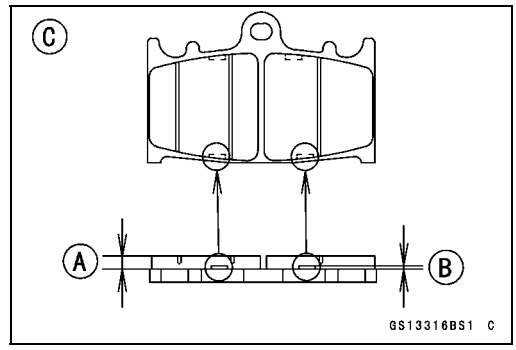
Periodic Maintenance Procedures

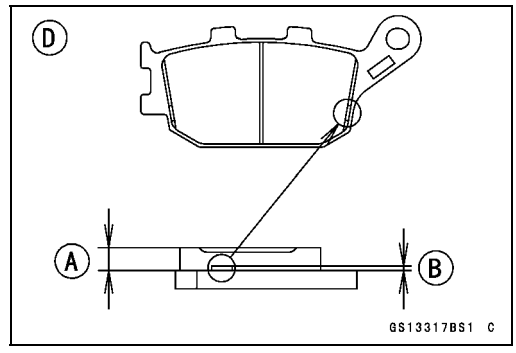
Brake Pad Wear Inspection

- Remove the brake pads (see Front/Rear Brake Pad Removal in the Brakes chapter).
- Check the lining thickness [A] of the pads in each caliper.

★If the lining thickness of either pad is less than the service limit [B], replace both pads in the caliper as a set.

[C] Front Brake Pad
[D] Rear Brake Pad





Pad Lining Thickness

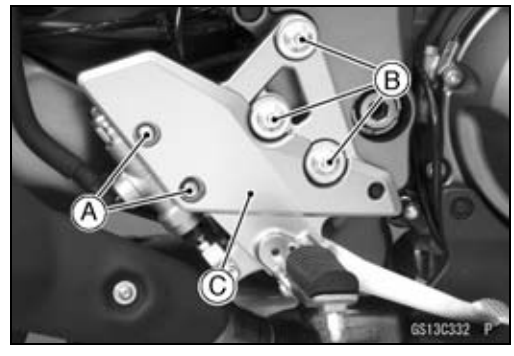
Standard:	
Front	**4.0 mm (0.16 in.)**
Rear	**5.0 mm (0.20 in.)**
Service Limit:	**1 mm (0.04 in.)**

Brake Light Switch Operation Inspection

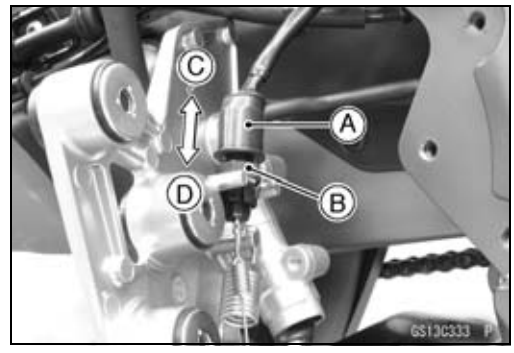
- Turn the ignition switch to ON.
- The brake light [A] should go on when the brake lever is applied or after the brake pedal is depressed about 10 mm (0.39 in.).

★If it does not, adjust the brake light switch as follows.

- Remove:
  Rear Master Cylinder Mounting Bolts [A]
  Footpeg Bracket Bolts [B] and Washers
  Footpeg Bracket [C]



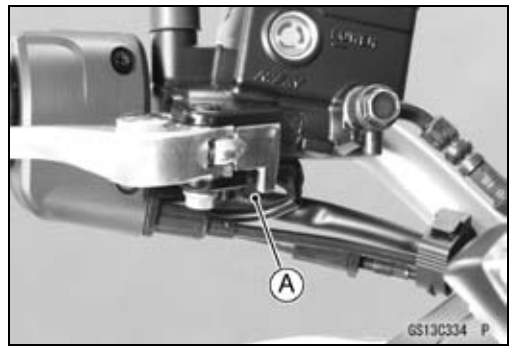
- While holding the switch body, turn the adjusting nut to adjust the switch.
  Switch Body [A]
  Adjusting Nut [B]
  Light sooner as the body rises [C]
  Light later as the body lowers [D]



NOTICE

To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.

★If it does not go on, inspect or replace the following items.
Battery (see Charging Condition Inspection in the Electrical System chapter)
Brake Light (see Tail/Brake Light Removal in the Electrical System chapter)
Main Fuse 30 A and Brake Light/HornFuse 10 A (see Fuse Inspection in the Electrical System chapter)
Front Brake Light Switch [A] (see Switch Inspection in the Electrical System chapter)
Rear Brake Light Switch (see Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)



● Tighten:

Torque - Front Footpeg Bracket Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Suspension

Front Forks/Rear Shock Absorber Operation Inspection

● Pump the forks down and up [A] 4 or 5 times, and inspect the smooth stroke.
★If the forks do not smoothly or noise is found, inspect the fork oil level or fork clamps (see Front Fork Oil Change in the Suspension chapter).

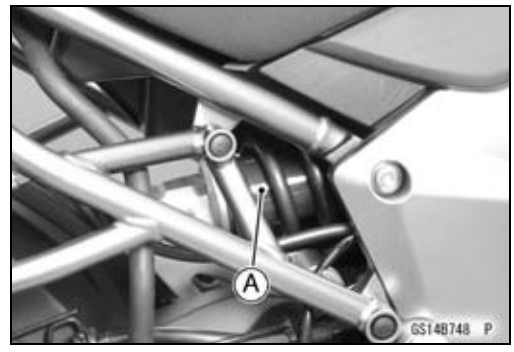
● Pump the seat down and up [A] 4 or 5 times, and inspect the smooth stroke.
★If the shock absorber does not smoothly stroke or noise is found, inspect the oil leak (see Rear Shock Absorber Oil Leak Inspection).

Front Fork Oil Leak Inspection

● Visually inspect the front forks [A] for oil leakage.
★Replace or repair any defective parts, if necessary.

Periodic Maintenance Procedures

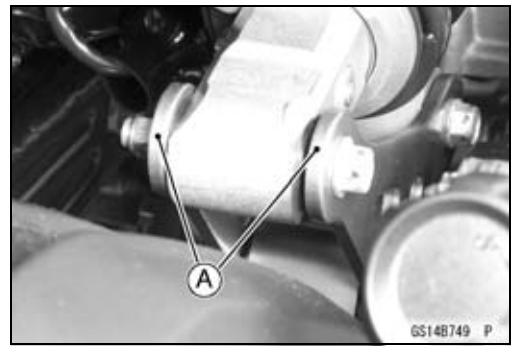
Rear Shock Absorber Oil Leak Inspection



- Visually inspect the shock absorber [A] for oil leakage.

★If the oil leakage is found on it, replace the shock absorber with a new one.

Rocker Arm Operation Inspection



- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.

★If the rocker arms [A] do not smoothly stroke or noise is found, inspect the fasteners and bearings (see Rocker Arm/Tie-Rod Bearing, Sleeve Inspection in the Suspension chapter).

Tie-Rod Operation Inspection

- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.

★If the tie-rod [A] does not smoothly stroke or noise is found, inspect the fasteners and tie-rod bearings (see Rocker Arm/Tie-Rod Bearing, Sleeve Inspection in the Suspension chapter).

Steering

Steering Play Inspection

- Remove the lower fairing (see Lower Fairing Removal in the Frame chapter).
- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheels/Tires chapter).
- With the front wheel pointing straight ahead, alternately tap each end of the handlebars. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.

★If the wheel binds or catches before the stop, the steering is too tight.

- Feel for steering looseness by pushing and pulling [A] the forks.

★If you feel looseness, the steering is too loose.

NOTE

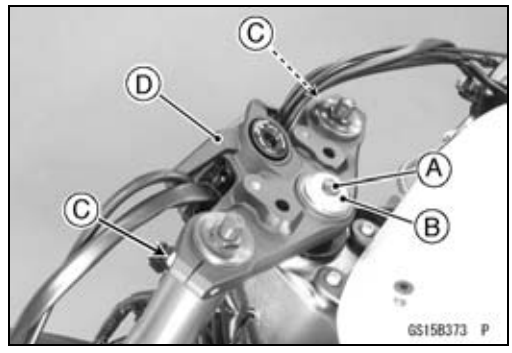
○*The cables and wiring will have some effect on the motion of the fork which must be taken into account.*

○*Be sure the leads and cables are properly routed.*

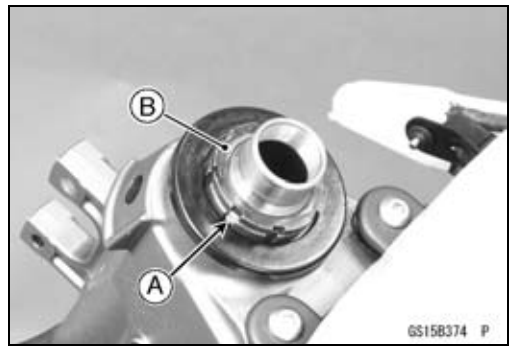
○*The bearings must be in good condition and properly lubricated in order for any test to be valid.*

Periodic Maintenance Procedures

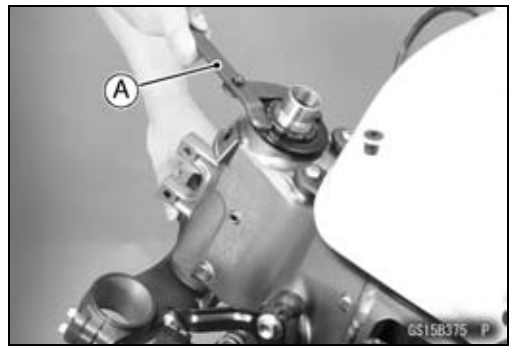
Steering Play Adjustment



- Remove:
  Upper Fairing Bracket (see Upper Fairing Bracket Removal in the Frame chapter)
  Handlebars and Lower Handlebar Holder (see Handlebar Removal in the Steering chapter)
  Steering Stem Head Bolt Plug [A]
  Steering Stem Head Bolt [B]
  Upper Front Fork Clamp Bolts [C] (Loosen)
  Stem Head [D]



- Bend the claws [A] of the claw washer back.
- Remove the steering stem locknut [B] and claw washer.



- Adjust the steering.

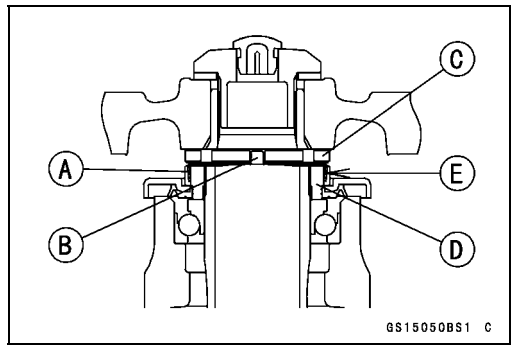
Special Tool - Steering Stem Nut Wrench [A]: 57001-1100

★If the steering is too tight, loosen the stem nut a fraction of a turn.

★If the steering is too loose, tighten the stem nut a fraction of a turn.

NOTE

○*Turn the stem nut 1/8 turn at time maximum.*



- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until the claw washer touches the steering stem nut.
- Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].
- Install the stem head.
- Tighten:

Torque - Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 79.7 ft·lb)
Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

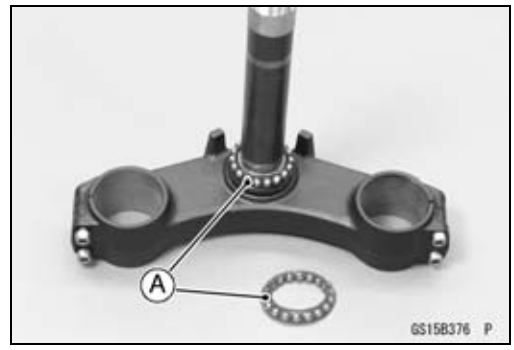
- Check the steering again.

★If the steering is still too tight or too loose, repeat the adjustment.

- Install the removed parts (see appropriate chapters).

Periodic Maintenance Procedures

Steering Stem Bearing Lubrication



- Remove the steering stem (see Stem, Stem Bearing Removal in the Steering chapter).
- Using a high flash-point solvent, wash the upper and lower ball bearings in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean off grease and dirt.
- Visually check the outer races and the ball bearings.

★Replace the bearing assemblies if they show wear or damage.

- Pack the upper and lower ball bearings [A] in the cages with grease, and apply a light coat of grease to the upper and lower outer races.
- Install the steering stem (see Stem, Stem Bearing Installation in the Steering chapter).
- Adjust the steering (see Steering Play Adjustment).

Periodic Maintenance Procedures

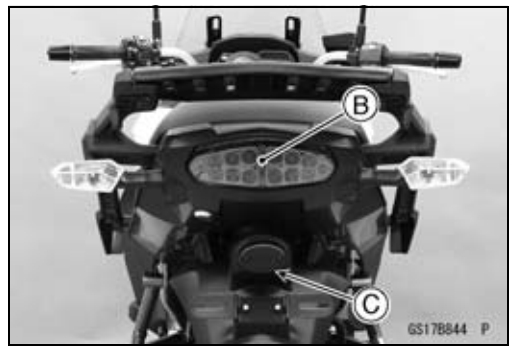
Electrical System

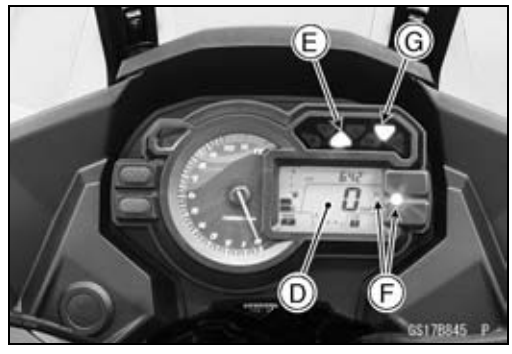
Lights and Switches Operation Inspection

First Step

- Set the gear position in the neutral position.
- Turn the ignition switch to ON.
- The following lights should go on according to below table.

City Light [A]	goes on
Taillight [B]	goes on
License Plate Light [C]	goes on
Meter Panel LCD [D]	goes on
Green Neutral Indicator Light (LED) [E]	goes on
Warning Symbol and Red Warning Indicator Light (LED) [F]	goes on
Yellow ABS Indicator Light (LED) [G]	goes on





★If the light does not go on, inspect or replace the following item.

Battery (see Charging Condition Inspection in the Electrical System chapter)
Main Fuse 30 A and Brake Light/Horn Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Applicable Bulb (see Wiring Diagram in the Electrical System chapter)
Meter Unit for Meter Panel LCD (see Electronic Combination Meter Unit Inspection in the Electrical System chapter)
Meter Unit for Green Neutral Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
Meter Unit for Red Warning Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)
Yellow ABS Indicator Light (LED) (see Yellow ABS Indicator Light (LED) Inspection in the Brakes chapter)

- Turn the ignition switch to OFF.
- The all lights should go off.

○For models equipped with an immobilizer system, red warning indicator light (LED) and immobilizer symbol will blinks. Refer to the Immobilizer System (Equipped Models) section in the Electrical System chapter.

★If the light does not go off, replace the ignition switch.

Second Step (Other then CA Model)

- Turn the ignition switch to P (Park) position.
- The city light, taillight and license plate light should go on.

★If the light does not go on, inspect or replace the following item.

Ignition Switch (see Switch Inspection in the Electrical System chapter)

Periodic Maintenance Procedures

Third Step

- Turn on the turn signal switch [A] (left or right position).
- The left or right turn signal lights [B] (front and rear) according to the switch position should blink.
- The green turn signal indicator light (LED) [C] in the meter unit should blink.

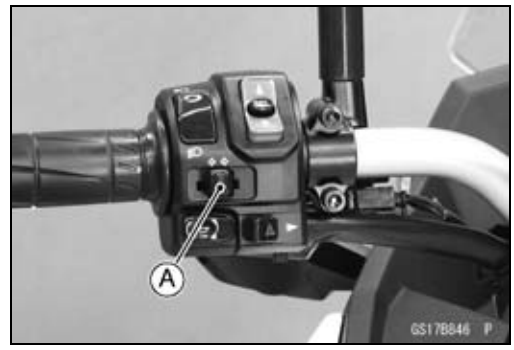
★If the each light does not blink, inspect or replace the following item.

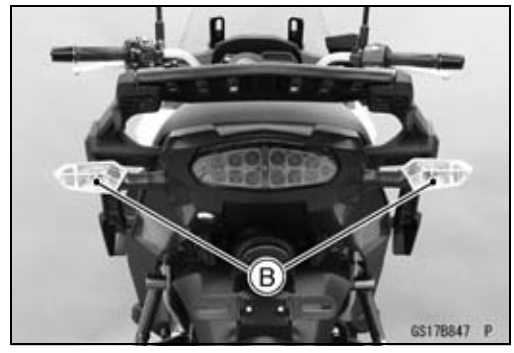
Turn Signal Light Bulb (see Turn Signal Light Bulb Replacement in the Electrical System chapter)
Meter Unit for Green Turn Signal Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
Turn Signal Relay Fuse 7.5 A (see Fuse Inspection in the Electrical System chapter)
Turn Signal Switch (see Switch Inspection in the Electrical System chapter)
Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

- Push the turn signal switch.
- The turn signal lights and green indicator light (LED) should go off.

★If the light does not go off, inspect or replace the following item.

Turn Signal Switch (see Switch Inspection in the Electrical System chapter)



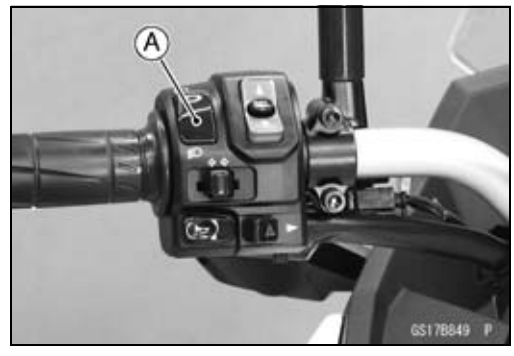


Fourth Step

- Set the dimmer switch [A] to low beam position.
- Start the engine.
- The low beam headlight should go on.

★If the low beam headlight does not go on, inspect or replace the following item.

Headlight Low Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Headlight Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)
Headlight Relay in Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)



Periodic Maintenance Procedures

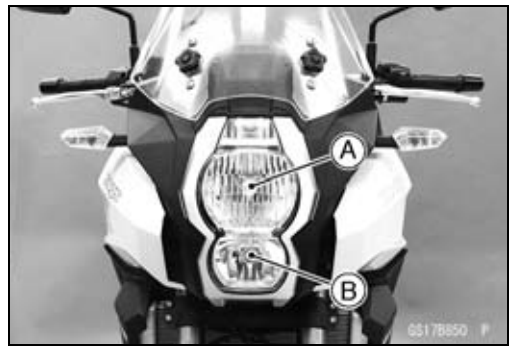
- Set the dimmer switch to blue high beam position.
- The low beam [A] and high beam [B] headlights should go on.
- The blue high beam indicator light (LED) [C] should go on.

★If the high beam headlight and/or blue high beam indicator light (LED) does not go on, inspect or replace the following item.
Headlight Blue High Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Meter Unit for Blue High Beam Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)

- Turn the engine stop switch to stop position.
- The low beam and high beam headlights should stay going on.

★If the headlights and blue high beam indicator light (LED) does go off, inspect or replace the following item.
Headlight Relay in Relay Box (see Relay Circuit Inspection in the Electrical System chapter)

- Turn the ignition switch to OFF.
- The headlights and blue high beam indicator light (LED) should go off.



Headlight Aiming Inspection

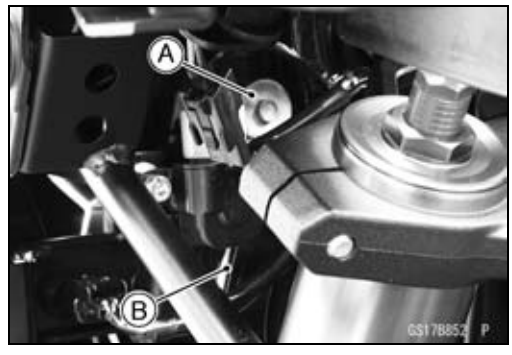
- Inspect the headlight beam for aiming.

★If the headlight beam is off the point, adjust the headlight aiming.

Headlight Beam Horizontal Adjustment

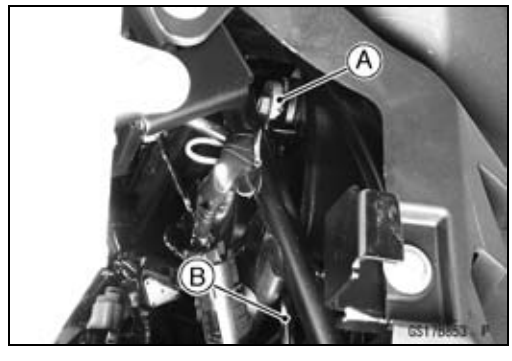
- Remove the left middle fairing (see Middle Fairing in the Frame chapter.)
- Turn the horizontal adjuster [A] on the headlight with the phillips tip screwdriver [B] in or out until the beam points straight ahead.

★If the headlight beam points too low or high, adjust the vertical beam.



Headlight Beam Vertical Adjustment

- Remove the right middle fairing (see Middle Fairing in the Frame chapter.)
- Turn the vertical adjuster [A] on the headlight with the phillips tip screwdriver [B] in or out to adjust the headlight vertically.



NOTE

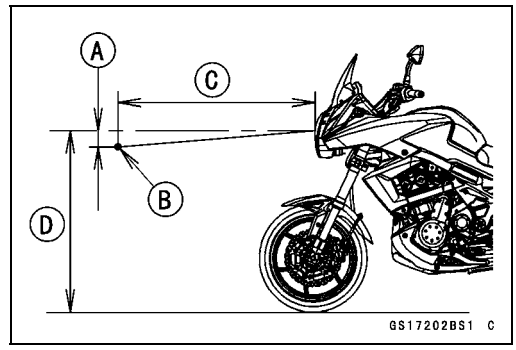
○*On high beam, the brightest points should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight to the proper angle according to local regulations.*

Periodic Maintenance Procedures

NOTE

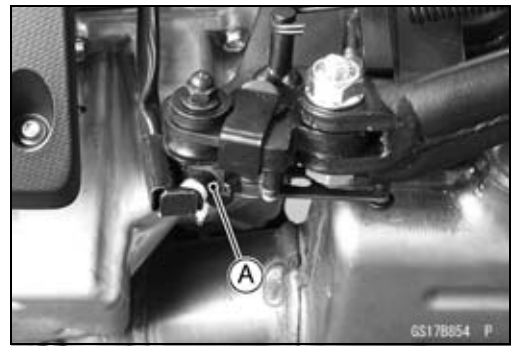
○*For CA model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2 in.) drop at 7.6 m (25 ft) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.*

50 mm (2 in.) [A]
Center of Brightest Spot [B]
7.6 m (25 ft) [C]
Height of Headlight Center [D]



Sidestand Switch Operation Inspection

- Inspect the sidestand switch [A] operation accordance to the following table.



Sidestand Switch Operation

Sidestand	Gear Position	Clutch Lever	Engine Start	Engine Run
Up	Neutral	Released	Starts	Continue running
Up	Neutral	Pulled in	Starts	Continue running
Up	In Gear	Released	Doesn't start	Continue running
Up	In Gear	Pulled in	Starts	Continue running
Down	Neutral	Released	Starts	Continue running
Down	Neutral	Pulled in	Starts	Continue running
Down	In Gear	Released	Doesn't start	Stops
Down	In Gear	Pulled in	Doesn't start	Stops

★If the sidestand switch operation does not work, inspect or replace the following item.
Battery (see Charging Condition Inspection in the Electrical System chapter)
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
Ignition Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Sidestand Switch (see Switch Inspection in the Electrical System chapter)
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)
Starter Button (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Switch Inspection in the Electrical System chapter)
Starter Relay (see Starter Relay Inspection in the Electrical System chapter)
Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

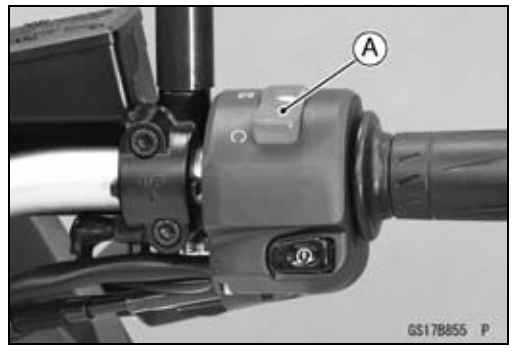
★If the all parts are good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

Engine Stop Switch Operation Inspection

First Step

- Turn the ignition switch to ON.
- Set the neutral position.
- Turn the engine stop switch to stop position [A].
- Push the starter button.
- The engine does not start.

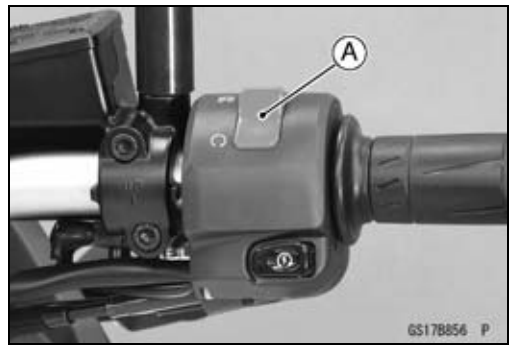
★If the engine starts, inspect or replace the following item.
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)



Second Step

- Turn the ignition switch to ON.
- Set the neutral position.
- Turn the engine stop switch to run position [A].
- Push the starter button and run the engine.
- Turn the engine stop switch to stop position.
- Immediately the engine should be stop.

★If the engine does not stop, inspect or replace the following item.
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)



Periodic Maintenance Procedures

Others

Chassis Parts Lubrication

- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

NOTE

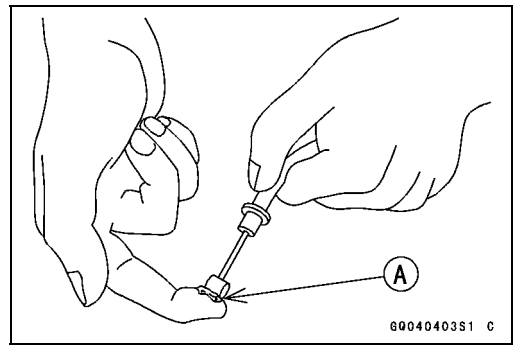
○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

Pivots: Lubricate with Grease.

Brake Lever
Brake Pedal
Clutch Lever
Rear Brake Joint Pin
Sidestand

Points: Lubricate with Grease.

Clutch Inner Cable Upper and Lower Ends [A]
Throttle Inner Cable Upper and Lower Ends

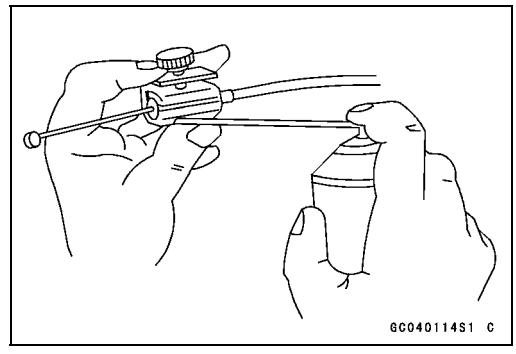


Cables: Lubricate with Rust Inhibitor.

Clutch Cable
Throttle Cables

- Lubricate the cables by seeping the oil between the cable and housing.

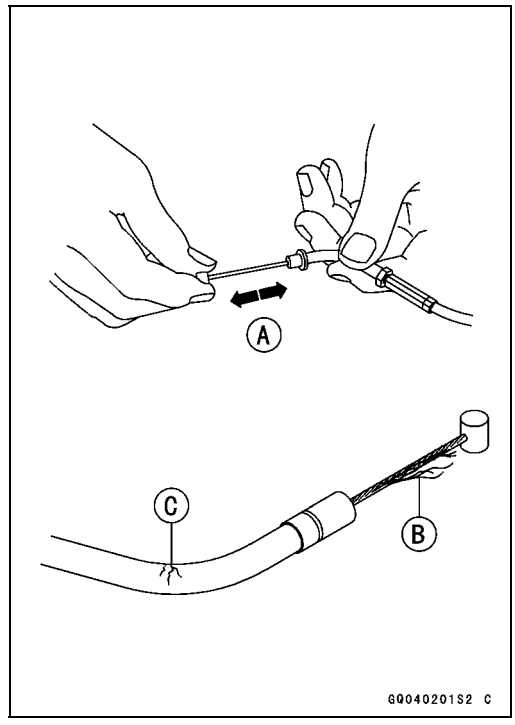
○The cable may be lubricated by using a commercially available pressure cable lubricator with an aerosol cable lubricant.



Periodic Maintenance Procedures

- With the cable disconnected at both ends, the cable should move freely [A] within the cable housing.

★If cable movement is not free after lubricating, if the cable is frayed [B], or if the cable housing is kinked [C], replace the cable.



Periodic Maintenance Procedures

Bolts, Nuts and Fasteners Tightness Inspection

● Check the tightness of the bolts and nuts listed here. Also, check to see that each cotter pin is in place and in good condition.

NOTE

○*For the engine fasteners, check the tightness of them when the engine is cold (at room temperature).*

★If there are loose fasteners, retighten them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not in the appropriate chapter, see the Standard Torque Table. For each fastener, first loosen it by 1/2 turn, then tighten it.

★If cotter pins are removed, replace them with new ones.

Bolt, Nut and Fastener to be checked

Engine:
- Clutch Lever Pivot Bolt Locknut
- Engine Mounting Bolts and Nuts
- Exhaust Pipe Manifold Holder Nuts
- Exhaust Pipe Mounting Bolt
- Muffler Body Clamp Bolt
- Muffler Body Mounting Bolt and Nut
- Radiator Upper and Lower Bolts
- Subframe Bolts

Wheels:
- Front Axle
- Front Axle Clamp Bolt
- Rear Axle Nut

Brakes:
- Brake Lever Pivot Nut
- Brake Pedal Bolt
- Brake Rod Joint Cotter Pin
- Caliper Mounting Bolts
- Front Master Cylinder Clamp Bolts
- Rear Master Cylinder Mounting Bolts

Suspension:
- Front Fork Clamp Bolts
- Rear Shock Absorber Bolt and Nut
- Swingarm Pivot Shaft Locknut
- Swingarm Pivot Shaft Nut
- Tie-Rod Nuts
- Rocker Arm Nut

Steering:
- Handlebar Holder Bolts
- Handlebar Holder Mounting Bolts and Nuts
- Steering Stem Head Bolt

Others:
- Footpeg Bracket Bolts
- Front Fender Bolts
- Sidestand Bolt

Periodic Maintenance Procedures

Replacement Parts

Air Cleaner Element Replacement

NOTE

○*In dusty areas, the element should be replaced more frequently than the recommended interval.*

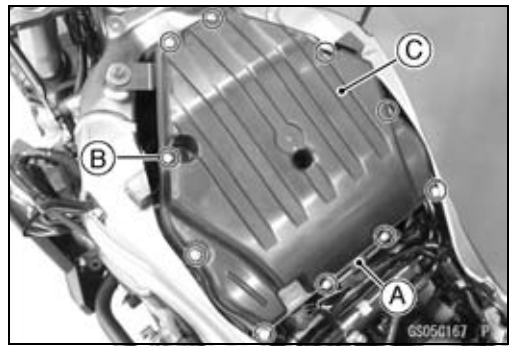
⚠ WARNING

If dirt or dust is allowed to pass through into the throttle body assy, the throttle may become stuck, possibly causing accident. Replace the air cleaner element according to the maintenance chart.

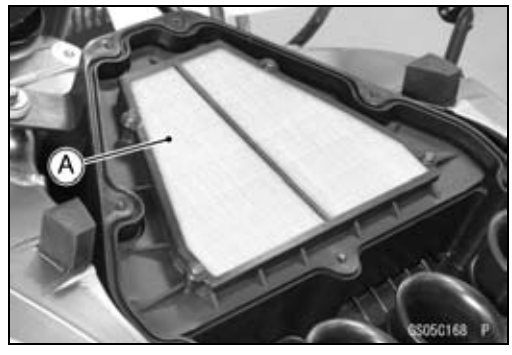
NOTICE

If dirt gets through into the engine, excessive engine wear and possibly engine damage will occur.

● Remove:
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
Connector Bracket [A]
Screws [B]
Upper Air Cleaner Housing [C]



● Discard the air cleaner element [A].



● Install a new element so that flat side faces forward.
● Tighten:

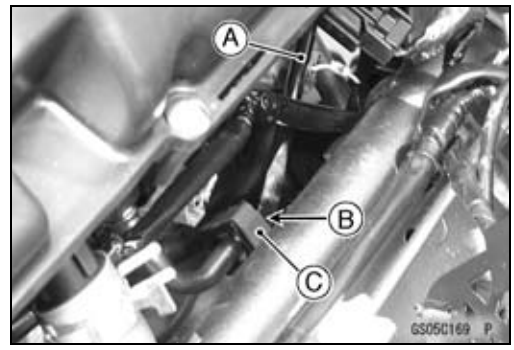
Torque - Upper Air Cleaner Housing Screws: 1.1 N·m (0.11 kgf·m, 1.0 in·lb)

Fuel Hose Replacement

● Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).

Periodic Maintenance Procedures

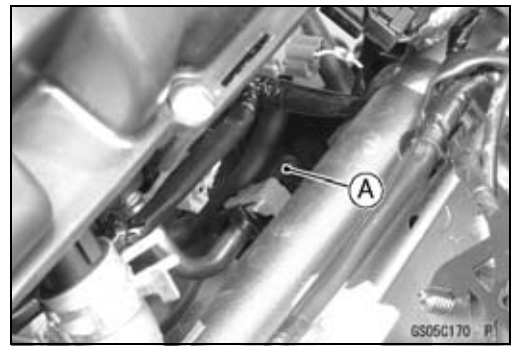
- Be sure to place a piece of cloth around the fuel hose joint.
- Insert a thin blade screwdriver [A] into the slit [B] on the joint lock [C].
- Turn the driver to disconnect the joint lock.



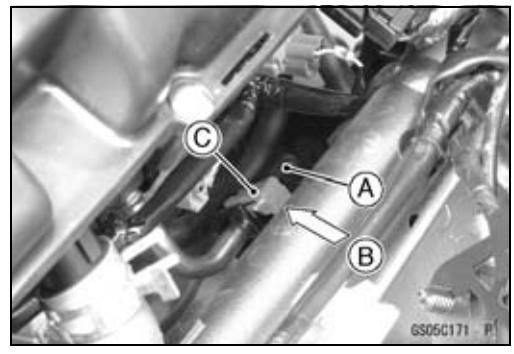
- Pull the fuel hose joint [A] out of the delivery pipe.

⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe. Cover the hose connection with a clean shop towel to prevent fuel spillage.



- Replace the fuel hose with a new one.
- Run the fuel hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Insert the fuel hose joint [A] straight onto the delivery pipe until the hose joint clicks.
- Push [B] the joint lock [C].

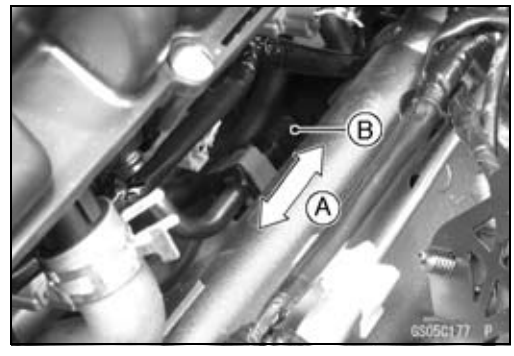


- Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and does not come off.

⚠ WARNING

Leaking fuel can cause a fire or explosion resulting in severe burns. Make sure the fuel hose joint is installed correctly on the delivery pipe and that it doesn't leak.

★If it comes off, reinstall the hose joint.



- Run the fuel hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
- Start the engine and check the fuel hose for leaks.

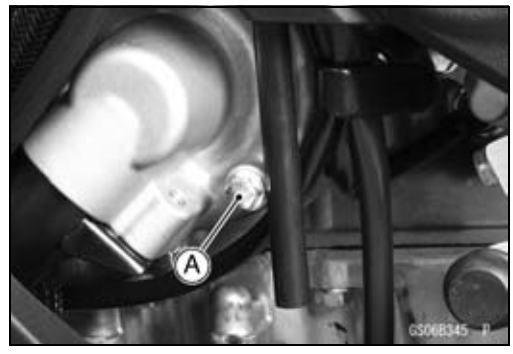
Periodic Maintenance Procedures

Coolant Change

⚠ WARNING

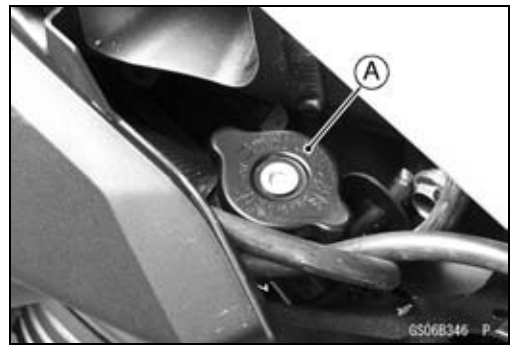
Coolant can be extremely hot and cause severe burns, is toxic and very slippery. Do not remove the radiator cap or attempt to change the coolant when the engine is hot; allow it cool completely. Immediately wipe any spilled coolant from tires, frame, engine or other painted parts. Do not ingest coolant.

- Place a container under the coolant drain bolt [A], then remove the drain bolt and drain bolt gasket.



- Remove the right middle fairing (see Middle Fairing Removal in the Frame chapter).
- Remove the radiator cap [A] in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.

○The coolant will drain from the radiator and engine.



- Remove:
  Hose [A]
  Reserve Tank Bolts [B]
- Turn over the reserve tank, remove the cap, and pour the coolant into a suitable container.
- Install the reserve tank.
- Replace the drain bolt gasket with a new one.
- Tighten the drain bolt with the gasket.

Torque - Coolant Drain Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)

Periodic Maintenance Procedures

● When filling the coolant, choose a suitable mixture ratio by referring to the coolant manufacturer's directions.

NOTICE

Soft or distilled water must be used with the antifreeze in the cooling system.
If hard water is used in the system, it causes scales accumulation in the water passages, and considerably reduces the efficiency of the cooling system.

Water and Coolant Mixture Ratio (Recommended)

Soft Water:	**50%**
Coolant:	**50%**
Freezing Point:	**–35°C (–31°F)**
Total Amount:	**2.6 L (2.7 US qt)**

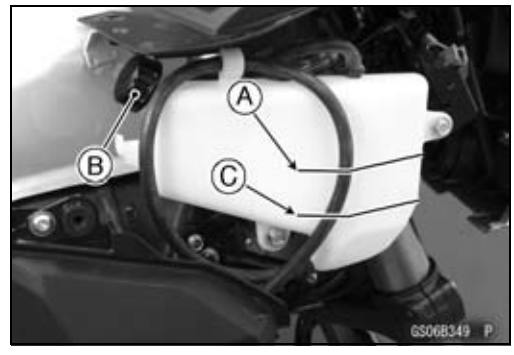
● Fill the radiator up to the filler neck [A] with coolant.

NOTE

○*Pour in the coolant slowly so that it can expel the air from the engine and radiator.*

● Check the cooling system for leaks.
● Tap the radiator hoses to force any air bubbles caught inside.
● Fill the radiator up to the filler neck with coolant.

● Fill the reserve tank up to the "F" (full) level line [A] with coolant and install the cap [B].
● Start the engine, warm it up thoroughly until the radiator fan turns on and then stop the engine.
● Check the coolant level in the reserve tank after the engine cools down.
★ If the coolant level is lower than the "L" (low) level line [C], add coolant to the "F" level line.



NOTICE

Do not add more coolant above the "F" level line.

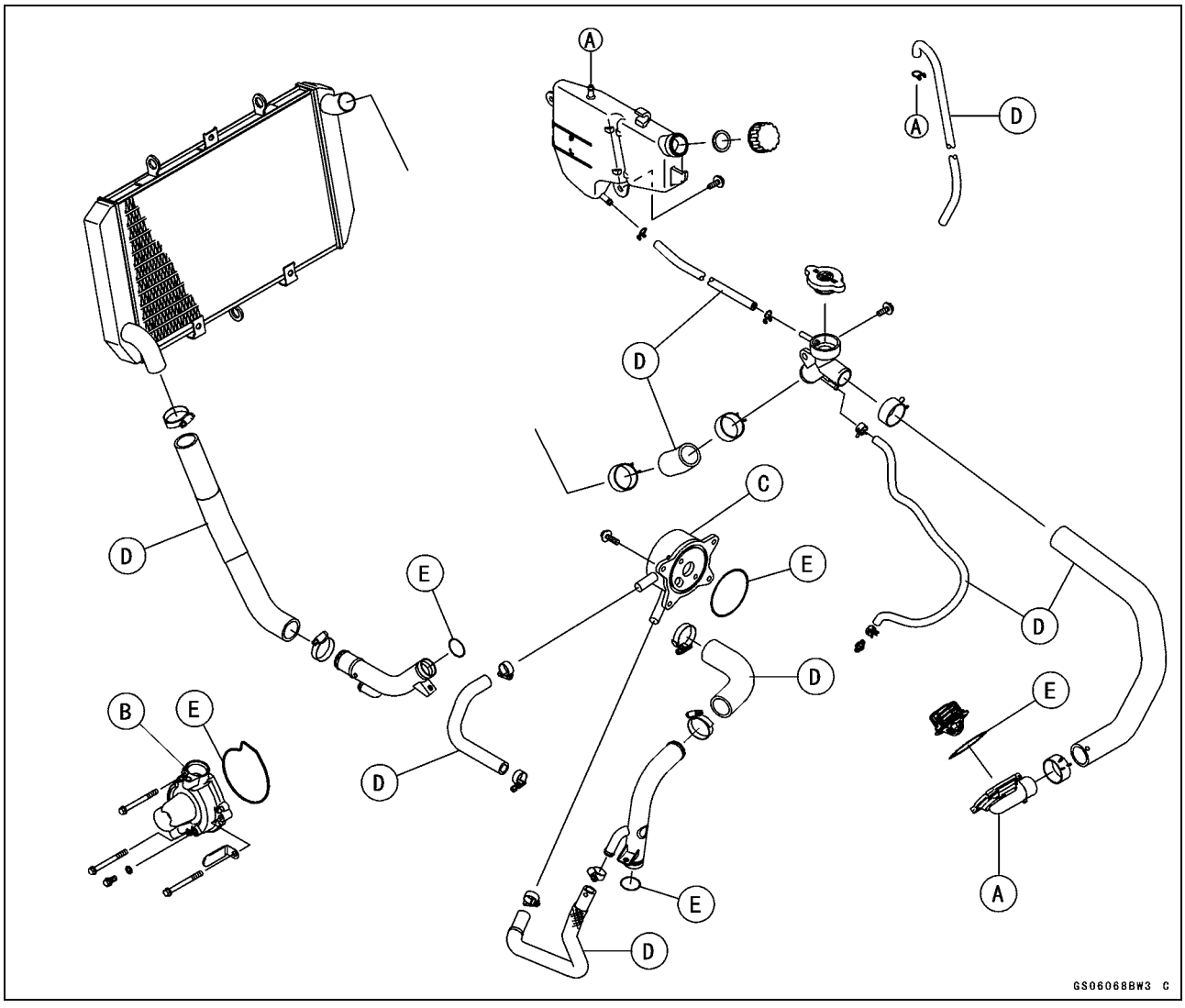
Periodic Maintenance Procedures

Radiator Hose and O-ring Replacement

- Drain the coolant (see Coolant Change).
- Remove:
  Thermostat Housing [A] (see Thermostat Removal in the Cooling System chapter)
  Water Pump Cover [B] (see Water Pump Removal in the Cooling System chapter)
  Oil Cooler [C] (see Oil Cooler Removal in the Engine Lubrication System chapter)
- Replace the hoses [D] and O-rings [E] with new ones.
- Apply grease to the O-rings and install them.
- Install the hoses and tighten the clamps securely.

Torque - Radiator (Water) Hose Clamp Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)

- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.



Periodic Maintenance Procedures

Engine Oil Change

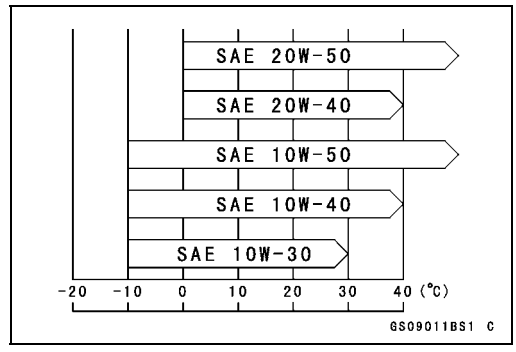
- Situate the motorcycle so that it is vertical after warming up the engine.
- Remove the engine oil drain bolt [A] to drain the oil.

○The oil in the oil filter can be drained by removing the filter (see Oil Filter Replacement).

- Replace the drain bolt gasket with a new one.
- Tighten:

Torque - Engine Oil Drain Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)

- Pour in the specified type and amount of oil.



Recommended Engine Oil

Type:	**API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2**
Viscosity:	**SAE 10W-40**
Capacity:	**3.2 L (3.4 US qt) (when filter is not removed)**
	3.8 L (4.0 US qt) (when filter is removed)
	4.0 L (4.2 US qt) (when engine is completely dry)

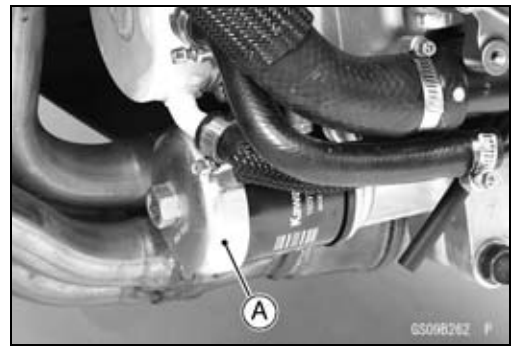
NOTE

○*Do not add any chemical additive to the oil. Oils fulfilling the above requirements are fully formulated and provide adequate lubrication for both the engine and the clutch.*

○*Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.*

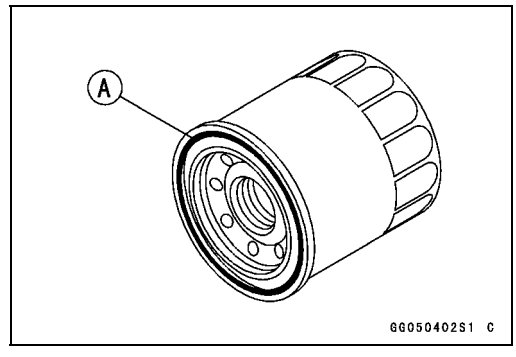
- Check the oil level (see Oil Level Inspection in the Engine Lubrication System chapter).

Oil Filter Replacement



- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Drain the engine oil (see Engine Oil Change).
- Remove the oil filter with the oil filter wrench [A].

Special Tool - Oil Filter Wrench: 57001-1249



- Replace the filter with a new one.
- Apply grease to the gasket [A] before installation.
- Tighten the filter with the oil filter wrench.

Torque - Oil Filter: 17 N·m (1.7 kgf·m, 13 ft·lb)

NOTE

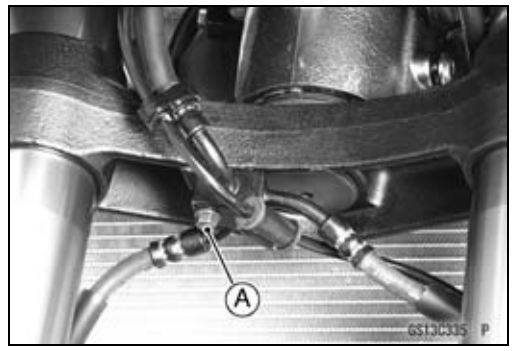
○*Hand tightening of the oil filter can not be allowed since it does not reach to this tightening torque.*

- Pour in the specified type and amount of oil (see Engine Oil Change).

Periodic Maintenance Procedures

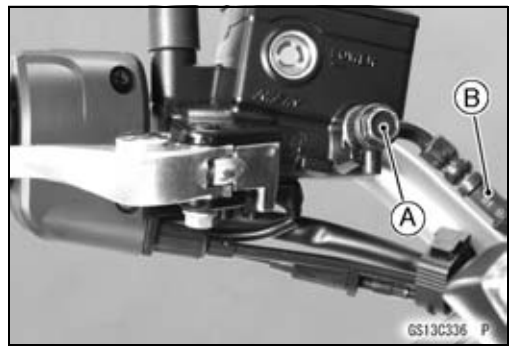
Brake Hose Replacement

- Remove:
  Brake Hose Fitting Bolt [A]

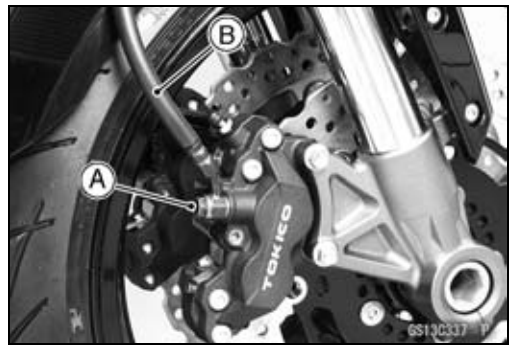


NOTICE

Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.



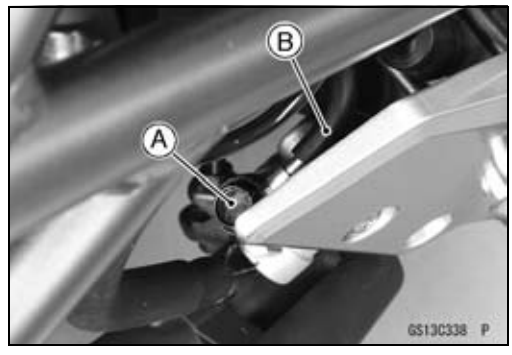
- Remove the brake hose banjo bolts [A].
- When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
- When removing the brake hoses [B], temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Immediately wash away any brake fluid that spills.



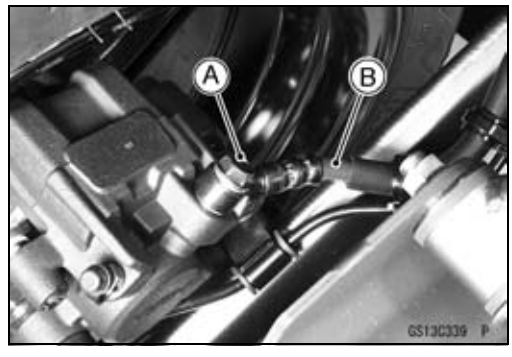
○There are washers on each side of the brake hose fitting.

- Replace them with new ones when installing.
- Fit the projection of the brake hose end to the calipers and master cylinders, and tighten the brake hose banjo bolts to the specified torque.

  Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



- When installing the hoses, avoid sharp bending, kinking, flatting or twisting, and route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Fill the brake line after installing the brake hose (see Brake Fluid Change).



Periodic Maintenance Procedures

● For the brake hoses of the ABS, note the following.

NOTE

○*When removing the brake pipes and hoses on the hydraulic unit, remove them according to each assembly of the exploded view in the Brakes chapter.*

● Remove:
Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
Rear Fender (see Flap and Rear Fender Removal in the Frame chapter)
Brake Pipe Joint Nuts [A]
Bolts [B]
Clamps [C]
● Open the band [D].
● Clear the brake pipe from the holder [E].
● There are washers on each side of the brake hose fitting. Replace them with new ones when installing.
● Before installing the brake pipe, check to see that there is no damage on the threads of the brake pipe joint nut.
★If there is any damage, replace the damaged parts with new ones.

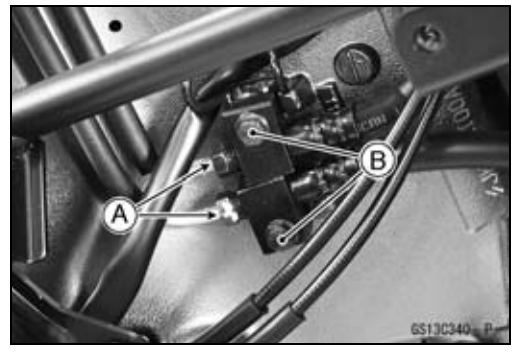
NOTE

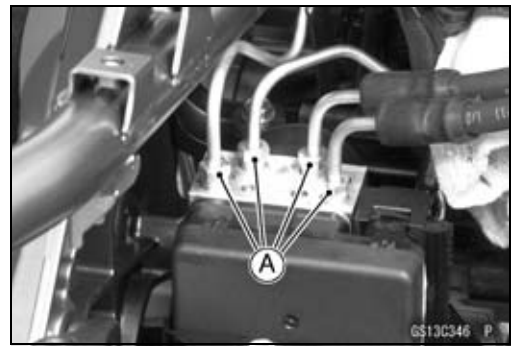
○*Hand tighten the brake pipe joint nuts at both ends of the brake pipe temporarily and then tighten them to the specified torque.*
○*Tighten the brake pipe joint nuts with the flare nut wrench.*

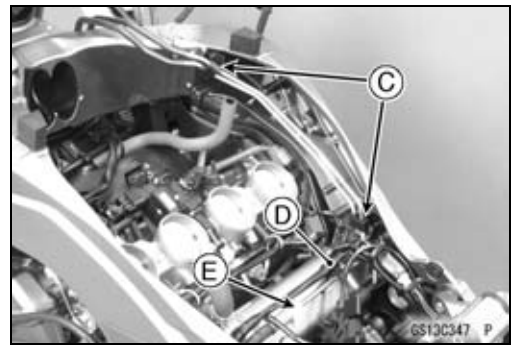
● Install the brake pipes at the specified angle (see Cable, Wire, and Hose Routing section in the Appendix chapter).
● Tighten:

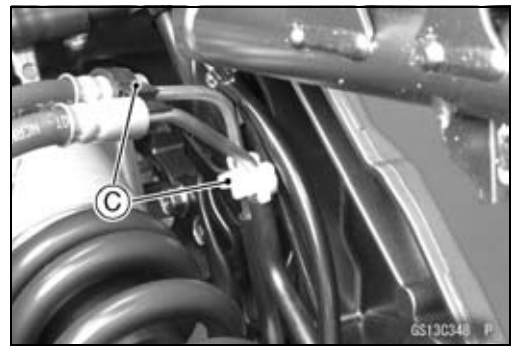
Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Pipe Joint Nuts: 18 N·m (1.8 kgf·m, 13 ft·lb)

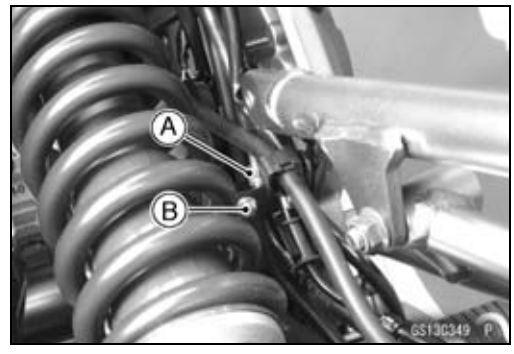
● When installing the hoses, avoid sharp bending, kinking, flatting or twisting, and route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
● Fill the brake line after installing the brake hose (see Brake Fluid Change).











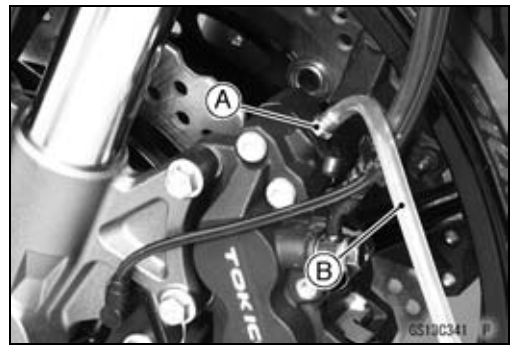
Periodic Maintenance Procedures

Brake Fluid Change

NOTE

○*The procedure to change the front brake fluid is as follows. Changing the rear brake fluid is the same as for the front brake.*

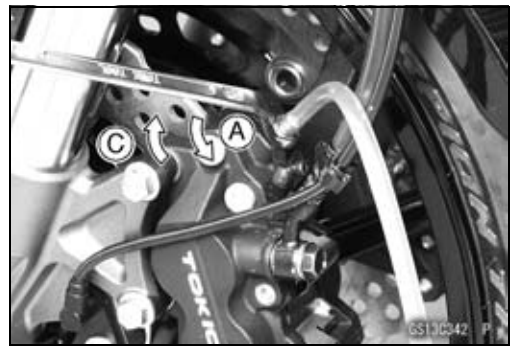
- Level the brake fluid reservoir.
- Remove the reservoir cap.
- Remove the rubber cap from the bleed valve [A] on the caliper.
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.
- Fill the reservoir with fresh specified brake fluid.



- Change the brake fluid.

○Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.

1. Open the bleed valve [A].
2. Apply the brake and hold it [B].
3. Close the bleed valve [C].
4. Release the brake [D].



NOTE

○*The fluid level must be checked often during the changing operation and replenished with fresh brake fluid. If the fluid in the reservoir runs out any time during the changing operation, the brakes will need to be bled since air will have entered the brake line.*

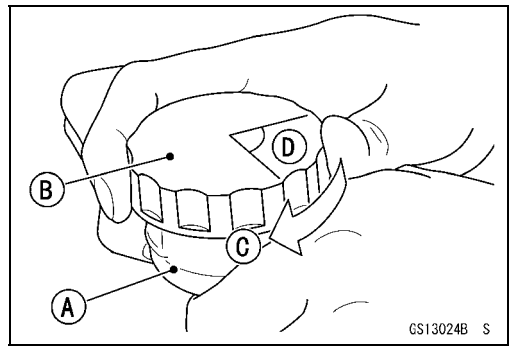
○*Front Brake: Repeat the above steps for the other caliper.*

- Tighten:

Torque - Front Master Cylinder Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)

- Follow the procedure below to install the front/rear brake fluid reservoir cap correctly.

○First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body, then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body [A].



- Tighten the bleed valve, and install the rubber cap.

Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)

- After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.

★If necessary, bleed the air from the lines.

Periodic Maintenance Procedures

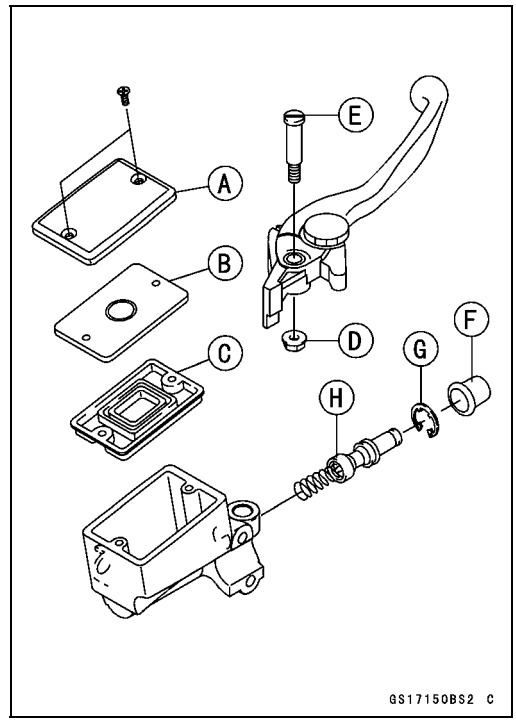
Master Cylinder Rubber Parts Replacement

Front Master Cylinder Disassembly

- Remove the front master cylinder (see Front Master Cylinder Removal in the Brakes chapter).
- Remove:
  Reservoir Cap [A]
  Diaphragm Plate [B]
  Diaphragm [C]
- Unscrew the locknut [D] and pivot bolt [E], and remove the brake lever.
- Remove the dust cover [F] and circlip [G].

Special Tool - Inside Circlip Pliers: 57001-143

- Pull out the piston assembly [H].
- Replace:
  Diaphragm [C]
  Dust Cover [F]
  Circlip [G]
  Piston Assembly [H]



Rear Master Cylinder Disassembly

- Remove the rear master cylinder (see Rear Master Cylinder Removal in the Brakes chapter).
- Remove the circlip [A], connector [B] and O-ring [C].

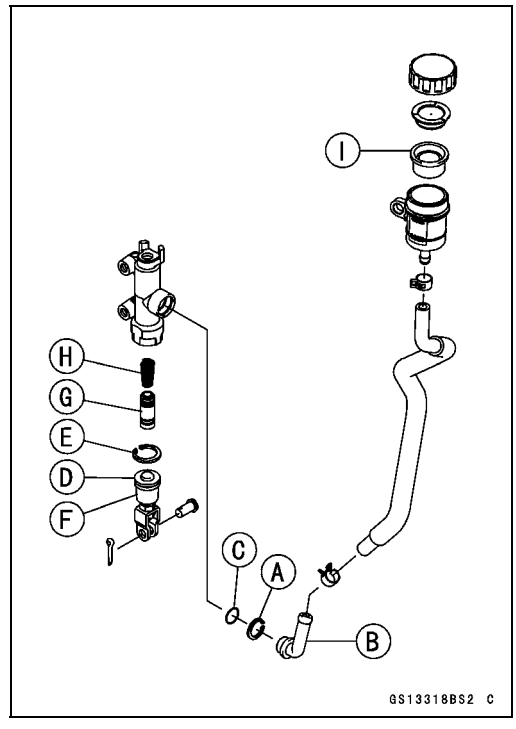
Special Tool - Inside Circlip Pliers: 57001-143

- Slide the dust cover [D] out of place, and remove the circlip [E].
- Pull out the push rod assy [F].
- Take off the piston assy [G] and return spring [H].

NOTICE

Do not remove the secondary cup from the piston since removal will damage it.

- Replace:
  Circlip [A]
  O-ring [C]
  Circlip [E]
  Push Rod Assy [F]
  Piston Assy [G]
  Diaphragm [I]



Master Cylinder Assembly

- Before assembly, clean all parts including the master cylinder with brake fluid or alcohol.

NOTICE

Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely, and will eventually deteriorate the rubber used in the disc brake.

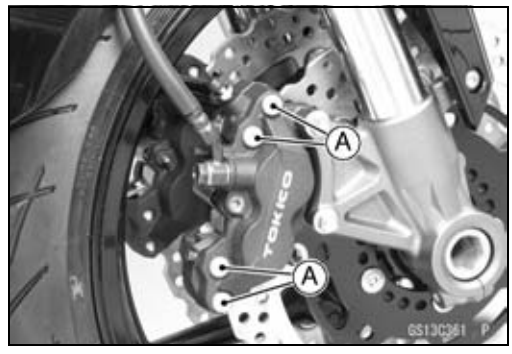
- Apply brake fluid to the new parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Apply silicone grease to the contact portion of the push rod and brake lever pivot bolt.
- Tighten:

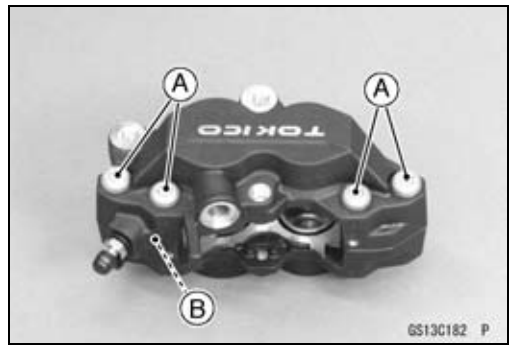
Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)
Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)

Caliper Rubber Parts Replacement

Front Caliper Disassembly

- Loosen the front caliper assembly bolts [A], and tighten it loosely.
- Remove:
  Front Caliper (see Front Caliper Removal in the Brakes chapter)
  Front Brake Pads (see Front Brake Pad Removal in the Brakes chapter)
- Remove the front caliper assembly bolts [A] and split the caliper.
- Remove the O-ring [B] on the oil passage of the caliper half.

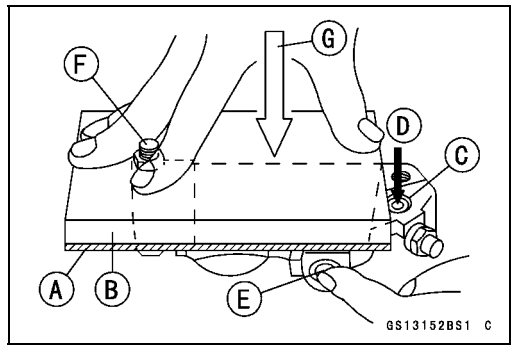




- Using compressed air, remove the pistons. One way to remove the pistons is as follows.

○Install a rubber gasket [A] and a wooden board [B] more than 10 mm (0.39 in.) thick on the caliper half, and fasten them together with a suitable bolt and nut as shown. Leave one of the oil passages [C] open.

○Lightly apply compressed air [D] to the oil passage until the pistons hit the rubber gasket. Block the hose joint opening [E] during this operation if the caliper half has the opening.
  Bolt [F] and Nut
  Push down [G].

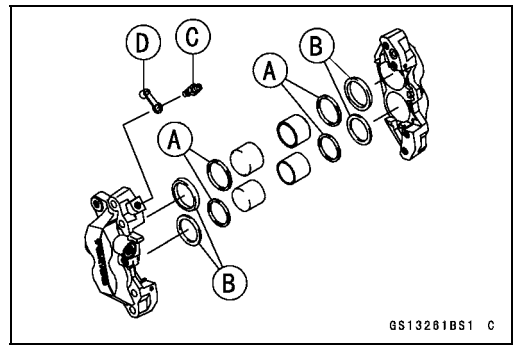


⚠ WARNING

The piston in the brake caliper can crush hands and fingers. Never place your hand or fingers in front of the piston.

Periodic Maintenance Procedures

○Pull out the pistons by hand.
● Remove the dust seals [A] and fluid seals [B].
● Remove the bleed valve [C] and rubber cap [D].
● Repeat the previous step to remove the pistons from the other side of the caliper body.



NOTE

○*If compressed air is not available, do as follows for both calipers coincidentally, with the brake hose connected to the caliper.*
○*Prepare a container for brake fluid, and perform the work above it.*
○*Remove the brake pads (see Front Brake Pad Removal in the Brakes chapter).*
○*Pump the brake lever until the pistons come out of the cylinders, and then disassemble the caliper.*

Front Caliper Assembly

● Clean the caliper parts except for the pads.

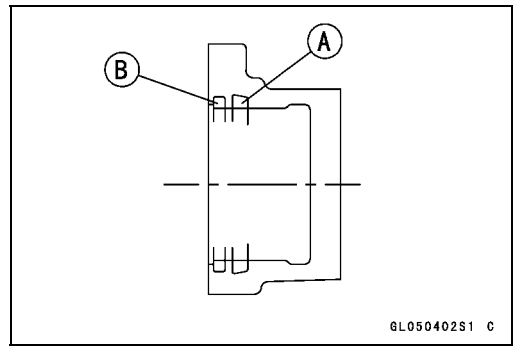
NOTICE

For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.

● Install the bleed valve and rubber cap.

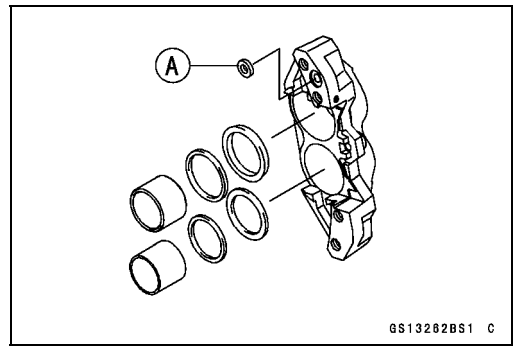
Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)

● Replace the fluid seals [A] with new ones.
○Apply silicone grease to the fluid seals, and install them into the cylinders by hand.
● Replace the dust seals [B] with new ones.
○Apply silicone grease to the dust seals, and install them into the cylinders by hand.



● Replace the O-ring [A] with a new one.
○Apply grease to the O-ring.
● Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
● Be sure to install the O-ring.
● Tighten:

Torque - Front Caliper Assembly Bolts: 22 N·m (2.2 kgf·m, 16 ft·lb)

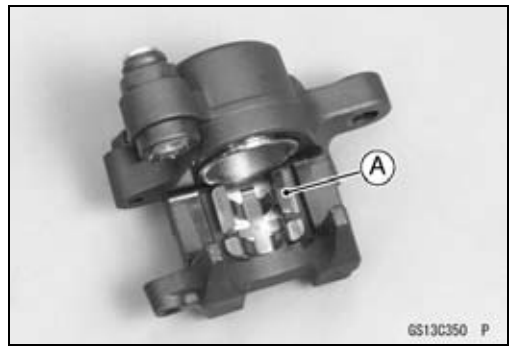


● Install the brake pads (see Front Brake Pad Installation in the Brakes chapter).
● Wipe up any spilled brake fluid on the caliper with wet cloth.

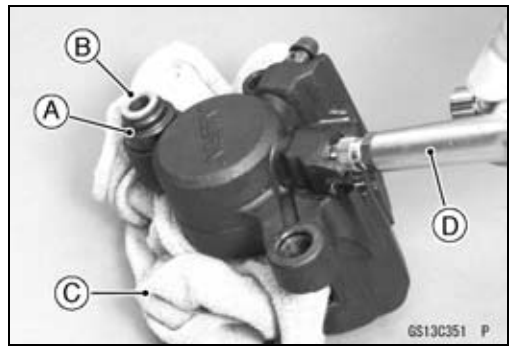
Periodic Maintenance Procedures

Rear Caliper Disassembly

● Remove:
Brake Pads (see Rear Brake Pad Removal in the Brakes chapter)
Rear Caliper (see Rear Caliper Removal in the Brakes chapter)
● Remove the pad spring [A].



● Remove:
Dust Boot [A]
Sleeve [B]
● Using compressed air, remove the piston.
○Cover the caliper opening with a clean, heavy cloth [C].
○Remove the piston by lightly applying compressed air [D] to where the brake line fits into the caliper.



⚠ WARNING

The piston in the brake caliper can crush hands and fingers. Never place your hand or fingers in front of the piston.

● Remove the dust seal and fluid seal.
● Remove the bleed valve and rubber cap.

NOTE

○*If compressed air is not available, do as follows with the brake hose connected to the caliper.*
○*Prepare a container for brake fluid, and perform the work above it.*
○*Remove the pads (see Rear Brake Pad Removal in the Brakes chapter).*
○*Pump the brake pedal to remove the caliper piston.*

Rear Caliper Assembly

● Clean the caliper parts except for the pads.

NOTICE

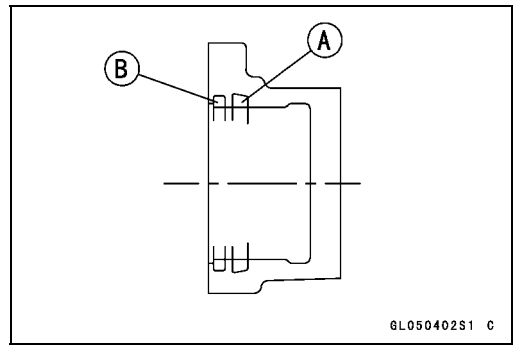
For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.

● Install the bleed valve and rubber cap.

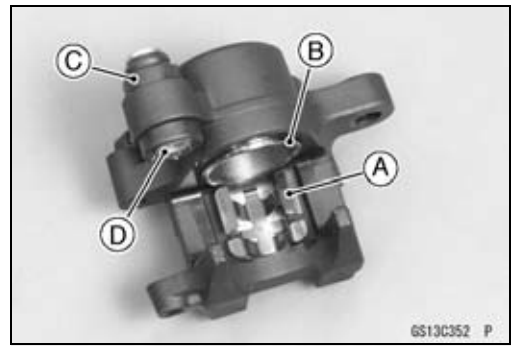
Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)

Periodic Maintenance Procedures

- Replace the fluid seal [A] with a new one.
○Apply silicone grease to the fluid seal, and install it into the cylinder by hand.
- Replace the dust seal [B] with a new one.
○Apply silicone grease to the dust seal, and install it into the cylinder by hand.



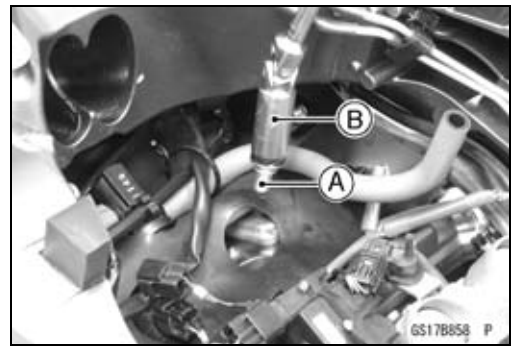
- Install the pad spring [A] in the caliper as shown in the figure.
- Apply brake fluid to the outside of the piston [B], and push it into the cylinder by hand.
- Replace the dust boot [C].
- Install the sleeve [D] with dust boot.
○Apply silicone grease to the sleeve.



Spark Plug Replacement

- Remove the stick coils (see Stick Coil Removal in the Electrical System chapter).
- Remove the spark plugs [A] using the plug wrench [B] vertically.

Special Tool - Spark Plug Wrench, Hex 16: 57001-1262



- Replace the spark plug with a new one.

Standard Spark Plug
Type: NGK CR9EIA-9

- Insert new spark plug in the plug wrench.
- Using the plug wrench vertically, tighten the plug.

NOTICE

The insulator of the spark plug may break if when the wrench is inclined during tightening.

Torque - Spark Plugs: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the stick coils properly (see Stick Coil Installation in the Electrical System chapter).
○Be sure the stick coils are installed by pulling up it lightly.

NOTE

○*Be careful not to tight the stick coil leads.*

Fuel System (DFI)

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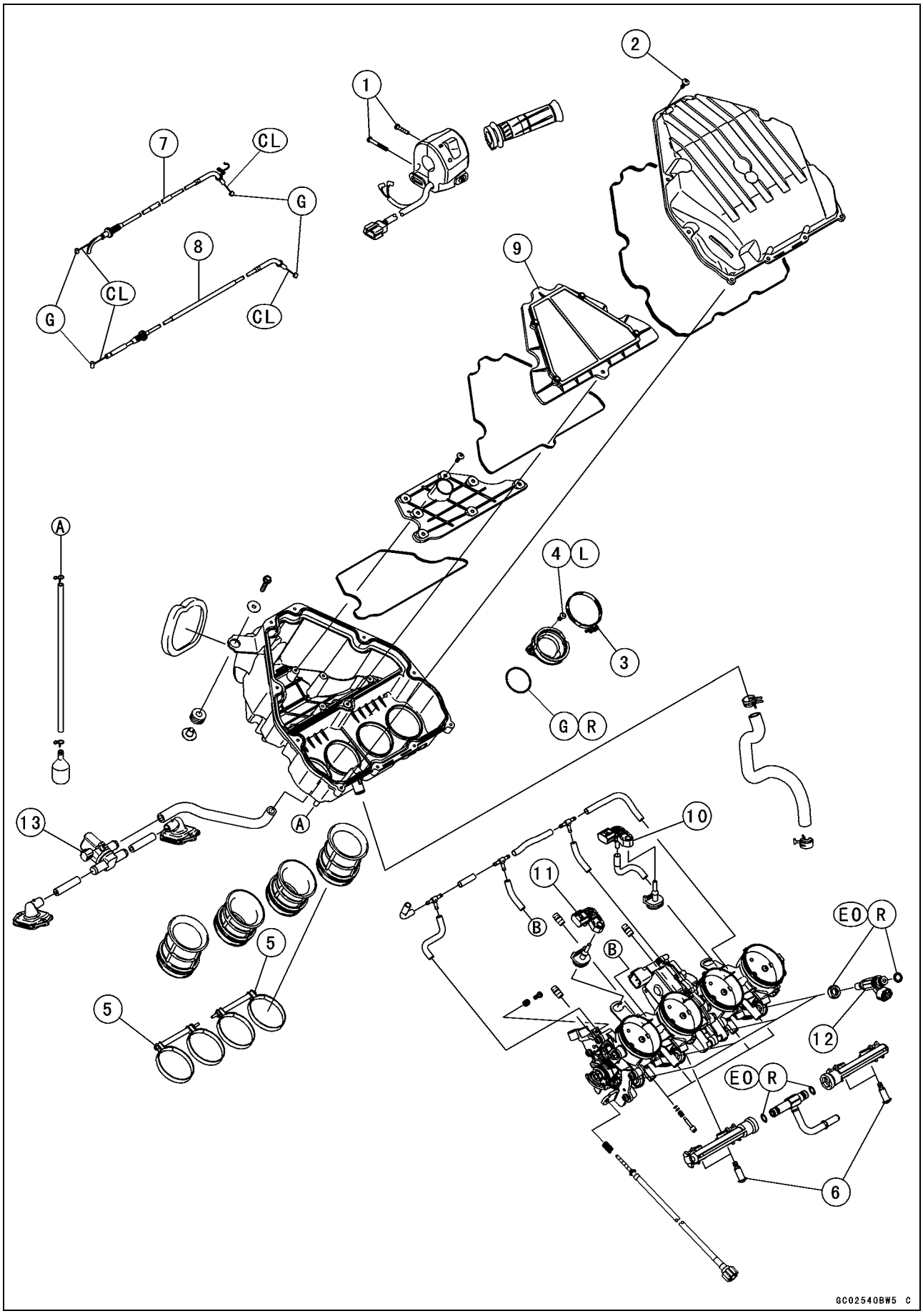
Exploded View



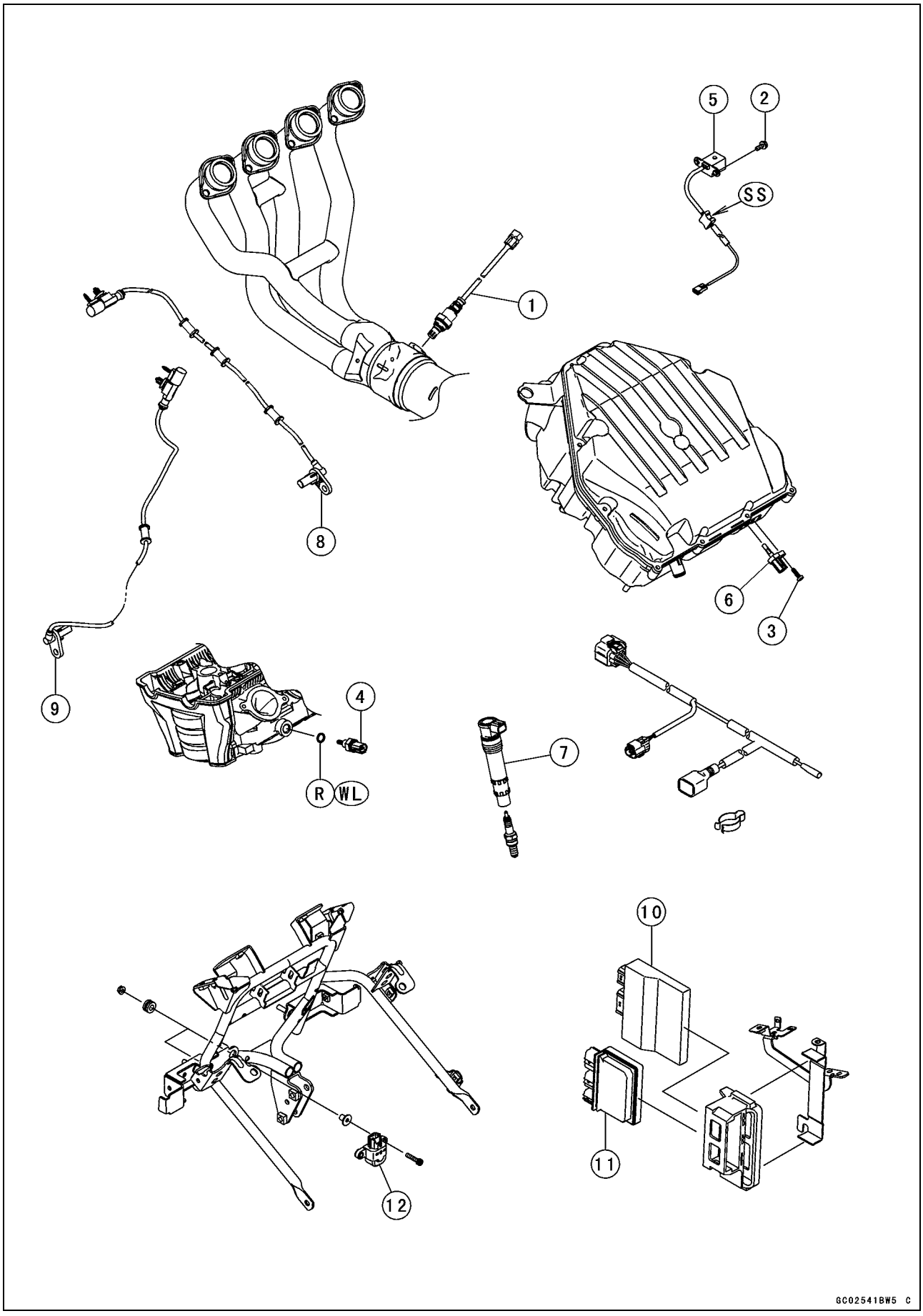
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Switch Housing Screws	3.5	0.36	31 in·lb	
2	Upper Air Cleaner Housing Screws	1.1	0.11	10 in·lb	
3	Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
4	Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
5	Air Cleaner Duct Clamp Bolts	2.0	0.20	18 in·lb	
6	Delivery Pipe Assy Mounting Screws	3.4	0.35	30 in·lb	

7. Throttle Cable (Accelerator)
8. Throttle Cable (Decelerator)
9. Air Cleaner Element
10. Intake Air Pressure Sensor #2
11. Intake Air Pressure Sensor #1
12. Fuel Injectors
13. Air Switching Valve

CL: Apply cable lubricant.
EO: Apply engine oil
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

Exploded View



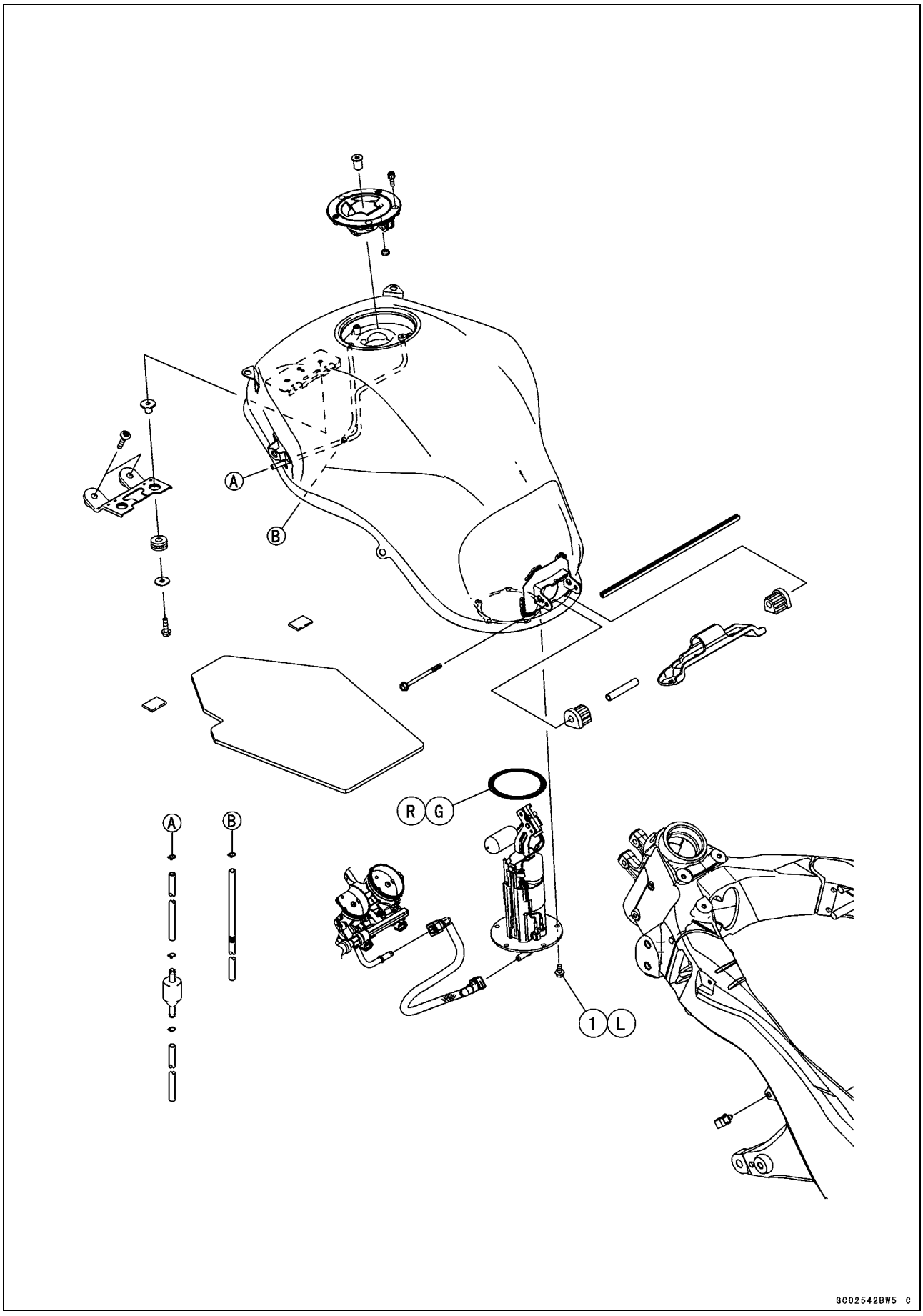
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oxygen Sensor	44	4.5	32	
2	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
3	Intake Air Temperature Sensor Mounting Screw	1.2	0.12	11 in·lb	
4	Water Temperature Sensor	12	1.2	106 in·lb	

5. Crankshaft Sensor
6. Intake Air Temperature Sensor
7. Stick Coils
8. Rear Wheel Rotation Sensor
9. Front Wheel Rotation Sensor
10. ECU
11. Relay Box
12. Vehicle-down Sensor

R: Replacement Parts
SS: Apply silicone sealant.
WL: Apply soap and water solution or rubber lubricant.

Exploded View



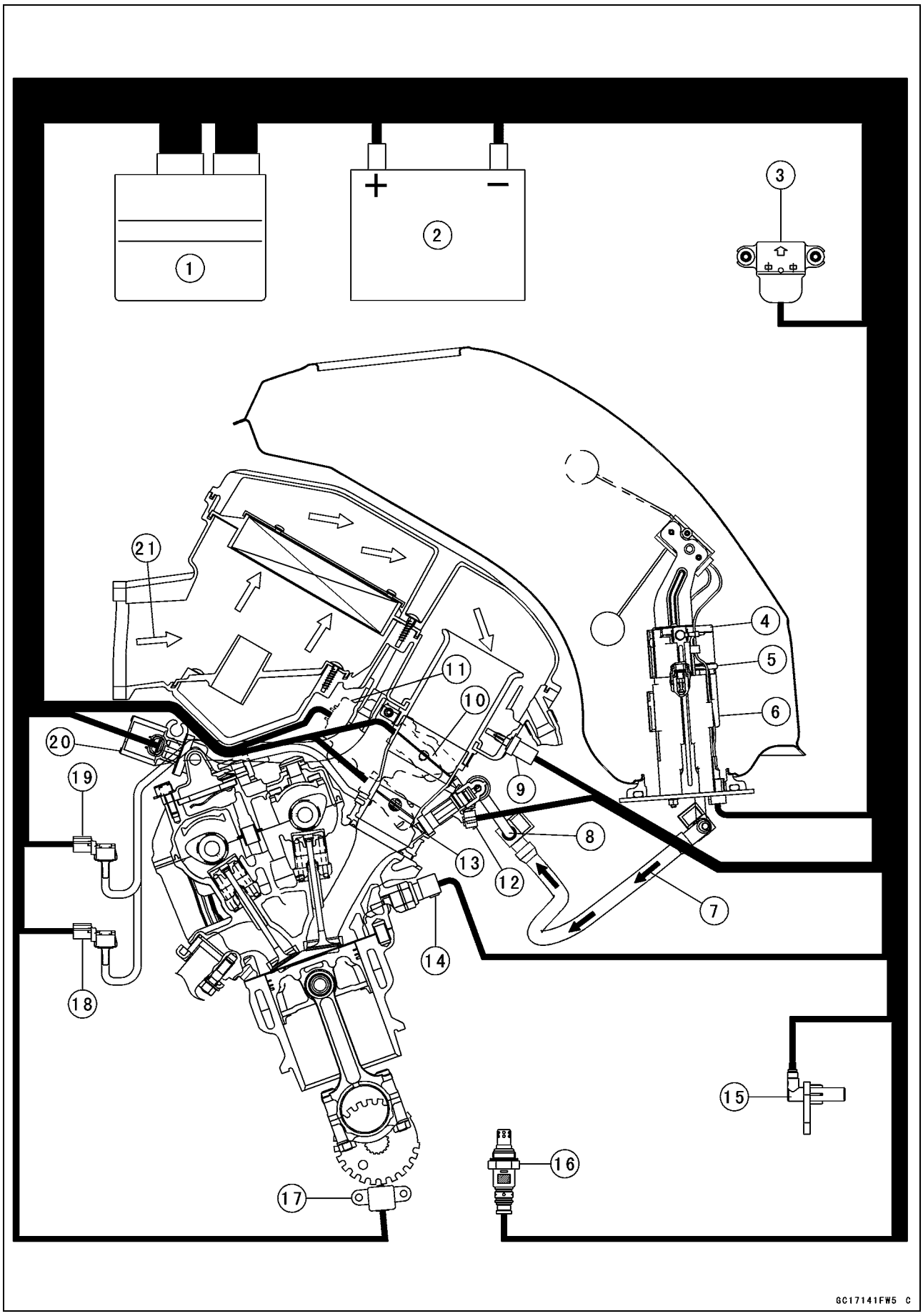
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Fuel Pump Bolts	9.8	1.0	87 in·lb	L

G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

DFI System

DFI System



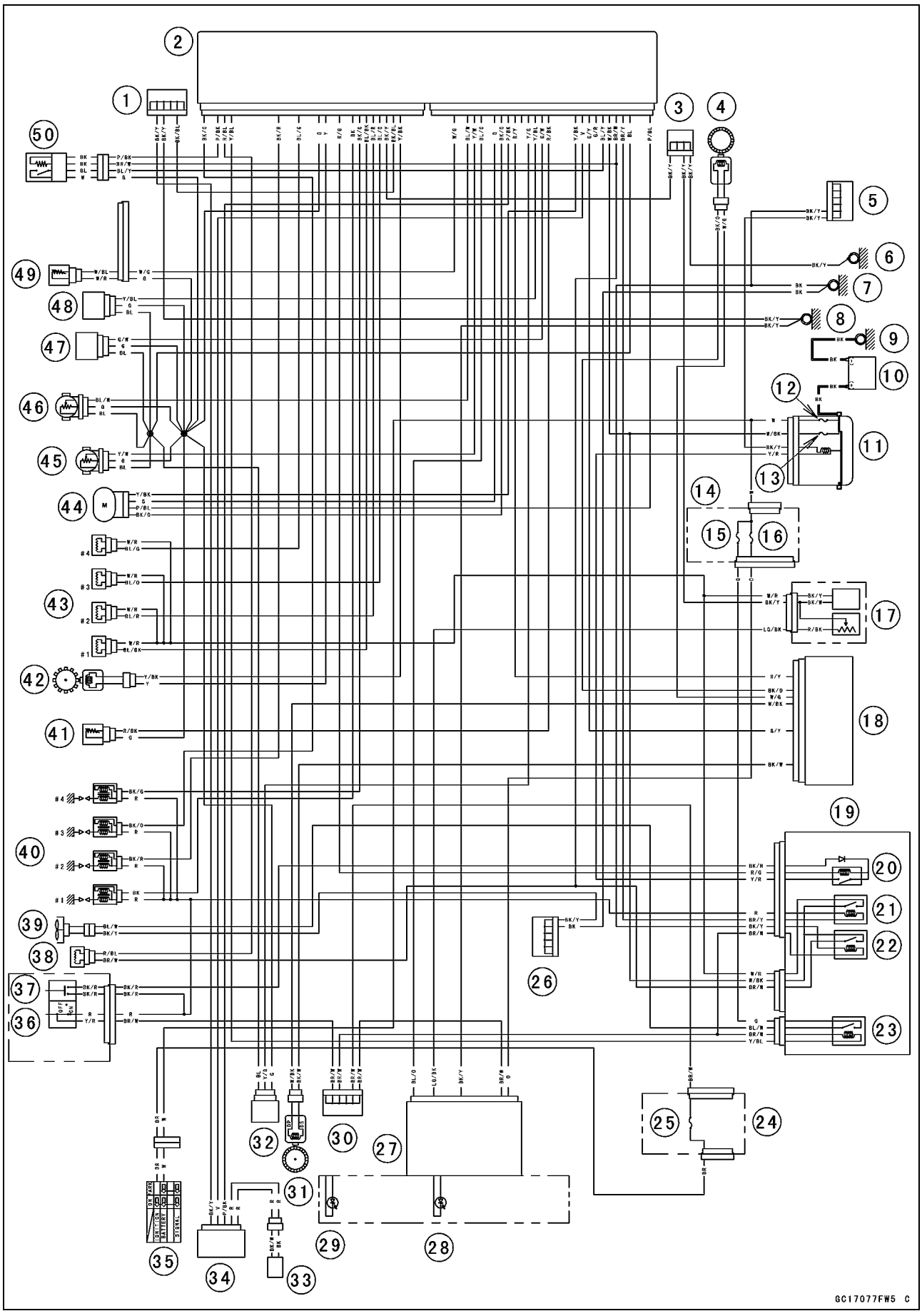
DFI System

1. ECU
2. Battery 12 V 8 Ah
3. Vehicle-down Sensor
4. Fuel Filter
5. Pressure Regulator
6. Fuel Pump
7. Fuel Flow
8. Delivery Pipe Assy
9. Intake Air Temperature Sensor
10. Subthrottle Sensor
11. Subthrottle Valve Actuator
12. Fuel Injectors
13. Main Throttle Sensor
14. Water Temperature Sensor
15. Rear Wheel Rotation Sensor
16. Oxygen Sensor
17. Crankshaft Sensor
18. Intake Air Pressure Sensor #2
19. Intake Air Pressure Sensor #1
20. Air Switching Valve
21. Air Flow

3-12 FUEL SYSTEM (DFI)

DFI System

DFI System Wiring Diagram



DFI System

Part Names

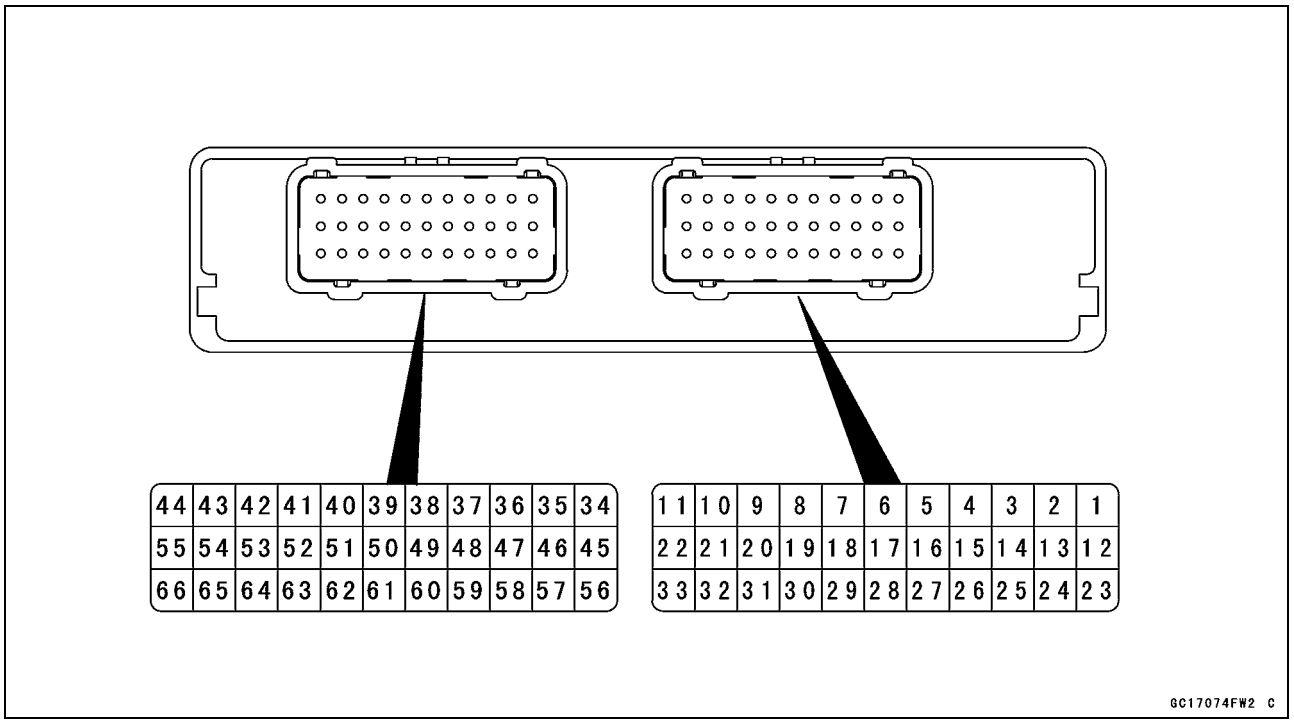
1. Joint Connector E
2. ECU
3. Joint Connector D
4. Rear Wheel Rotation Sensor
5. Joint Connector B
6. Frame Ground 2
7. Frame Ground 3
8. Frame Ground 1
9. Engine Ground
10. Battery 12 V 8 Ah
11. Starter Relay
12. Main Fuse 30 A
13. ECU Fuse 15 A
14. Fuse Box 2
15. Fan Fuse 15 A
16. Meter Fuse 7.5 A
17. Fuel Pump/Fuel Level Sensor
18. ABS Hydraulic Unit
19. Relay Box
20. Starter Circuit Relay
21. Fuel Pump Relay
22. ECU Main Relay
23. Radiator Fan Relay
24. Fuse Box 1
25. Ignition Fuse 15 A
26. Joint Connector C
27. Meter Unit
28. Red Warning Indicator Light (LED)
    Battery/Oil Pressure/Water Temperature/Immobilizer (Equipped Model)
29. Yellow Engine Warning Indicator Light (LED)
30. Joint Connector F
31. Front Wheel Rotation Sensor
32. Vehicle-down Sensor
33. Immobilizer Antenna (Equipped Model)
34. Immobilizer Amplifier (Equipped Model)
35. Ignition Switch
36. Engine Stop Switch
37. Starter Button
38. Air Switching Valve
39. Fan Motor
40. Spark Plugs
41. Intake Air Temperature Sensor
42. Crankshaft Sensor
43. Fuel Injectors
44. Subthrottle Valve Actuator
45. Main Throttle Sensor
46. Subthrottle Sensor
47. Intake Air Pressure Sensor #2
48. Intake Air Pressure Sensor #1
49. Water Temperature Sensor
50. Oxygen Sensor

DFI System

○Color Codes:

BK: Black	GY: Gray	PU: Purple
BL: Blue	LB: Light Blue	R: Red
BR: Brown	LG: Light Green	V: Violet
CH: Chocolate	O: Orange	W: White
DG: Dark Green	P: Pink	Y: Yellow
G: Green		

Terminal Numbers of ECU Connectors



Terminal Names

1. Subthrottle Valve Actuator: P/BL
2. Unused
3. Unused
4. Power Supply to Sensors: BL
5. Fuel Pump Relay: BR/Y
6. Power Supply to ECU (from ECU Main Relay): BR/W
7. Power Supply to ECU (from Battery): W/BK
8. Oxygen Sensor: BL/Y
9. KTRC Indicator Light: G/R
10. Front Wheel Rotation Sensor Signal: G/Y
11. Immobilizer Amplifier (Equipped Model): V
12. Subthrottle Valve Actuator: Y/BK
13. Unused
14. Unused
15. Unused
16. Intake Air Temperature Sensor: R/BK
17. Intake Air Pressure Sensor #2: G/W
18. Intake Air Pressure Sensor #1: Y/BL
19. Vehicle-down Sensor: Y/G
20. Rear Wheel Rotation Sensor Output: P
21. Rear Wheel Rotation Sensor Signal: R/Y
22. Immobilizer Amplifier (Equipped Model): P/BK
23. Subthrottle Valve Actuator: BK/O
24. Subthrottle Valve Actuator: G
25. Unused

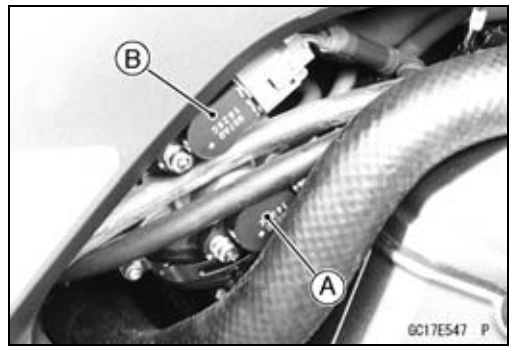
DFI System

26. External Communication Line (Meter Unit): BL/O
27. Main Throttle Sensor: Y/W
28. Subthrottle Sensor: BL/W
29. Unused
30. Water Temperature Sensor: W/G
31. Outside Temperature Sensor: BL/R
32. Unused
33. Sidestand Switch: G/BK
34. Left Switch Housing Upper Button (+): P/BL
35. Starter Button: R/BK
36. Neutral Switch: LG
37. Crankshaft Sensor (–): Y/BK
38. Ground for ECU: BK/BL
39. Ground for Fuel System: BK/Y
40. Fuel Injector #3: BL/O
41. Fuel Injector #2: BL/R
42. Fuel Injector #1: BL/BK
43. Stick Coil #4: BK/G
44. Stick Coil #1: BK
45. Left Switch Housing Lower Button (+): Y/R
46. Starter Lockout Switch: R/G
47. External Communication Line (Immobilizer, Equipped Model/*KDS): LG/BK
48. Crankshaft Sensor (+): Y
49. Ground for Sensors: G
50. Unused
51. Unused
52. Fuel Injector #4: BL/G
53. Unused
54. Unused
55. Stick Coil #2: BK/R
56. Left Switch Housing SEL Button (+): G/W
57. Engine Stop Switch: R
58. Ground: P
59. Unused
60. External Communication Line (Immobilizer, Equipped Model/*KDS): GY/BL
61. Meter Unit (Tachometer): LB
62. Radiator Fan Relay: Y/BL
63. Air Switching Valve: R/BL
64. Oxygen Sensor Heater: P/BK
65. Ground for Ignition System: BK/Y
66. Stick Coil #3: BK/O

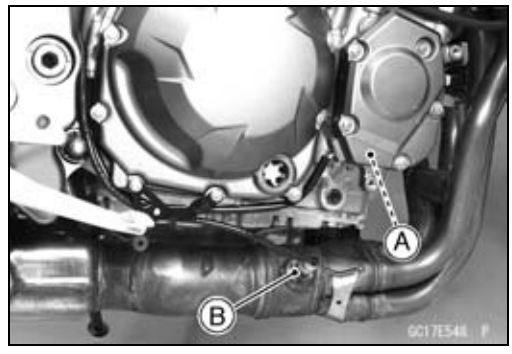
*: KDS (Kawasaki Diagnostic System)

DFI Parts Location

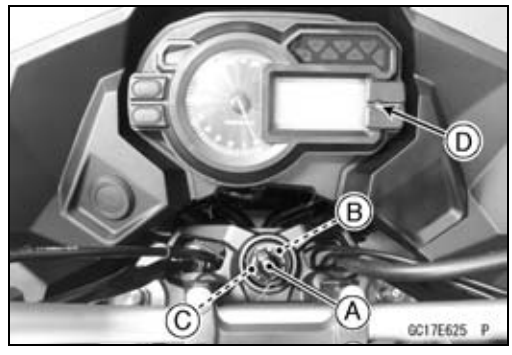
Main Throttle Sensor [A]
Subthrottle Sensor [B]



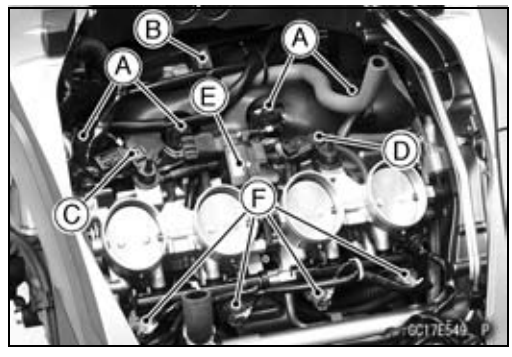
Crankshaft Sensor [A]
Oxygen Sensor [B]



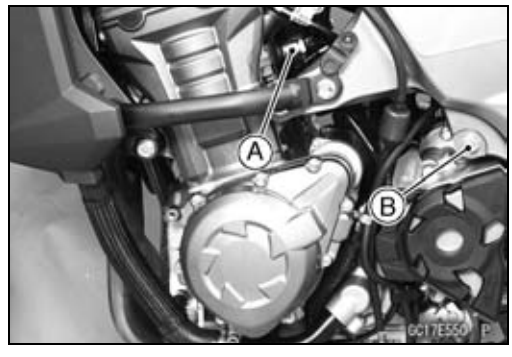
Ignition Key (Transponder, Equipped Model) [A]
Ignition Switch [B]
Immobilizer Antenna [C] (Equipped Model)
Red Warning Indicator Light (LED) [D]



Stick Coils [A]
Air Switching Valve [B]
Intake Air Pressure Sensor #1 [C]
Intake Air Pressure Sensor #2 [D]
Subthrottle Valve Actuator [E]
Fuel Injectors [F]

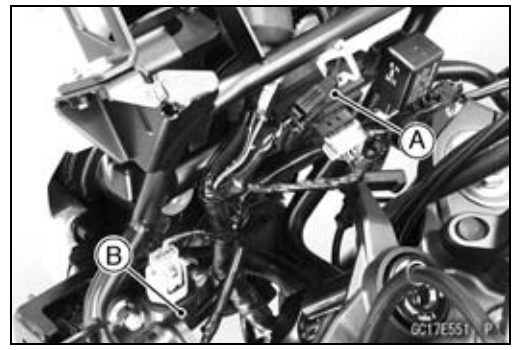


Water Temperature Sensor [A]
Engine Ground [B]



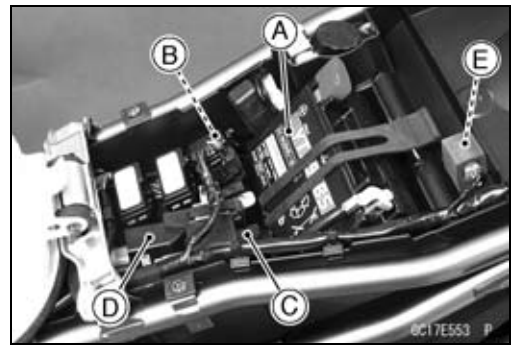
DFI Parts Location

Immobilizer Amplifier [A] (Equipped Model)
Vehicle-down Sensor [B]



Intake Air Temperature Sensor [A]
Frame Ground [B]

Battery 12 V 8 Ah [A]
ECU Fuse 15 A [B]
Relay Box (ECU Main Relay, Radiator Fan Relay, Fuel Pump Relay) [C]
ECU [D]
Immobilizer (Equipped Model)/Kawasaki Diagnostic System Connector [E]



Fuel Pump [A]

Rear Wheel Rotation Sensor [A]

Specifications

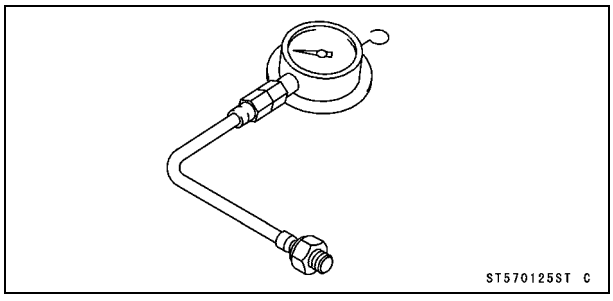
Item	Standard
Digital Fuel Injection System	
Idle Speed	1 100 ±50 r/min (rpm)
Throttle Body Assy:	
Throttle Valve	Dual throttle valve
Bore	ϕ38 mm (1.42 in.)
Throttle Body Vacuum	40.7 ±1.3 kPa (305 ±10 mmHg)
Bypass Screws (Turn Out)	2 1/2 (for reference)
ECU:	
Make	DENSO
Type	Digital memory type, with built in IC igniter, sealed with resin
Fuel Pressure (High Pressure Line)	294 kPa (3.0 kgf/cm², 43 psi) with engine idling
Fuel Pump:	
Type	In-tank friction pump
Discharge	50 mL (1.7 US oz.) or more for 3 seconds
Fuel Injectors:	
Type	INP-289
Nozzle Type	Fine atomizing type with 8 holes
Resistance	About 11.7 ~ 12.3 Ω at 20°C (68°F)
Main Throttle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 1.02 ~ 1.06 V at idle throttle opening
	DC 4.22 ~ 4.42 V at full throttle opening (for reference)
Resistance	4 ~ 6 kΩ
Intake Air Pressure Sensor #1/Intake Air Pressure Sensor #2:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.80 ~ 4.20 V at standard atmospheric pressure
Intake Air Temperature Sensor:	
Output Voltage	About DC 2.25 ~ 2.50 V at 20°C (68°F)
Resistance	5.4 ~ 6.6 kΩ at 0°C (32°F)
	0.29 ~ 0.39 kΩ at 80°C (176°F)
Water Temperature Sensor:	
Output Voltage	About DC 2.80 ~ 2.97 V at 20°C (68°F)
Vehicle-down Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V
	With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V

Specifications

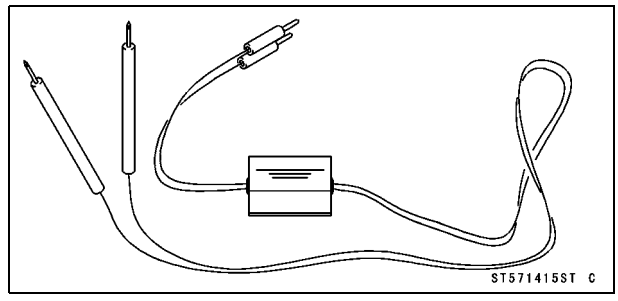
Item	Standard
Subthrottle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 1.08 ~ 1.12 V at subthrottle valve full close position
	DC 4.2 ~ 4.4 V at subthrottle valve full open position (for reference)
Resistance	4 ~ 6 kΩ
Immobilizer Antenna (Equipped Model):	
Resistance	About 3.0 ~ 4.6 Ω
Subthrottle Valve Actuator:	
Resistance	About 5.2 ~ 7.8 Ω
Input Voltage	About DC 11.5 ~ 13.5 V
Oxygen Sensor:	
Output Voltage (Rich)	DC 0.7 V or more
Output Voltage (Lean)	DC 0.2 V or less
Heater Resistance	11.7 ~ 14.5 Ω at 20°C (68°F)
Throttle Grip and Cables	
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
Air Cleaner	
Element	Viscous paper element

Special Tools and Sealant

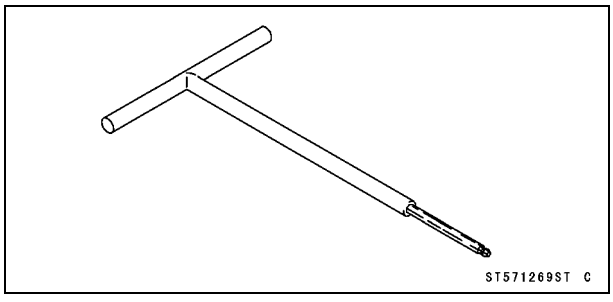
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



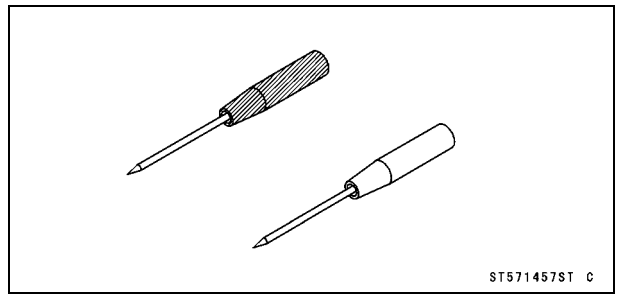
Peak Voltage Adapter:
57001-1415



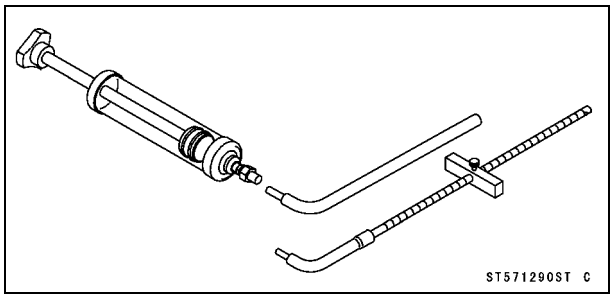
Carburetor Drain Plug Wrench, Hex 3:
57001-1269



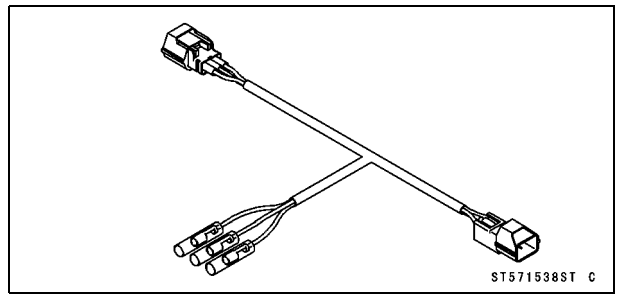
Needle Adapter Set:
57001-1457



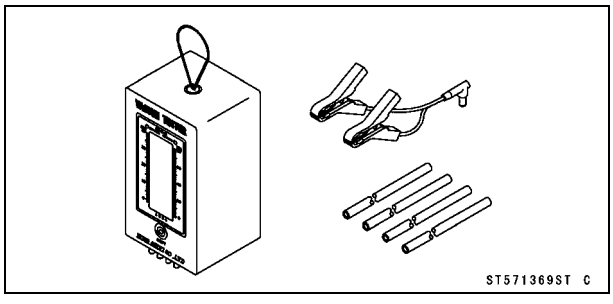
Fork Oil Level Gauge:
57001-1290



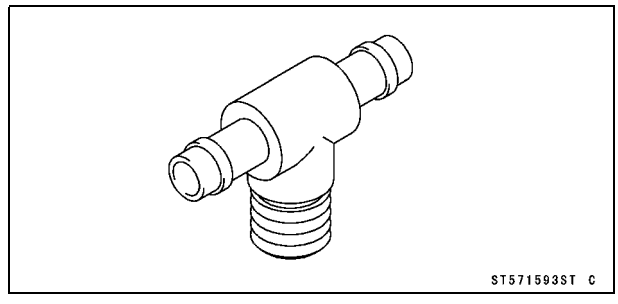
Throttle Sensor Setting Adapter:
57001-1538



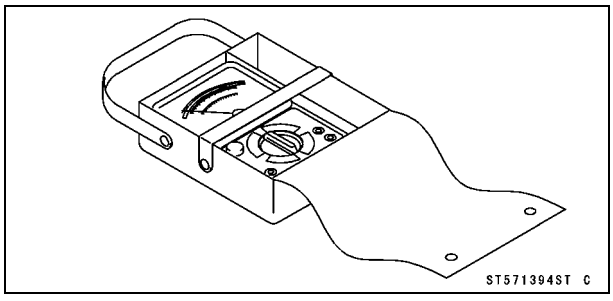
Vacuum Gauge:
57001-1369



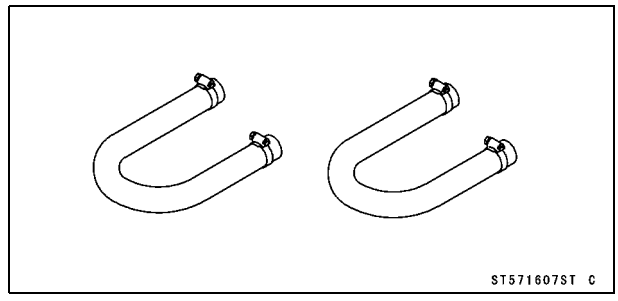
Fuel Pressure Gauge Adapter:
57001-1593



Hand Tester:
57001-1394

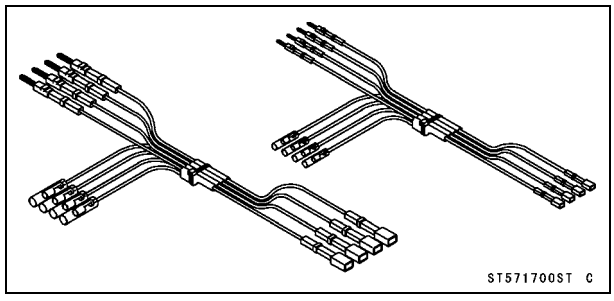


Fuel Hose:
57001-1607

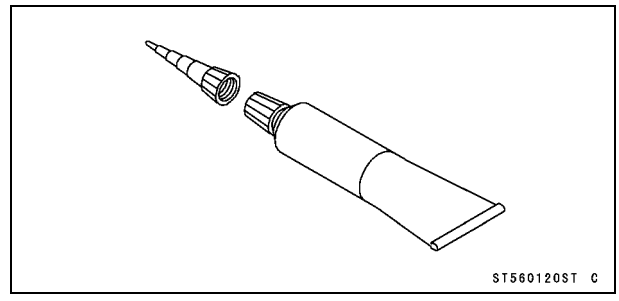


Special Tools and Sealant

Measuring Adapter:
57001-1700



Liquid Gasket, TB1211:
56019-120

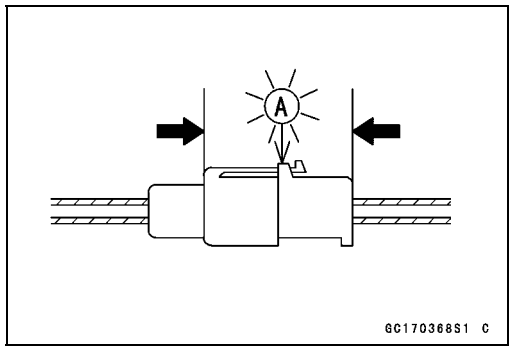


DFI Servicing Precautions

There are a number of important precautions that should be followed servicing the DFI system.

- This DFI system is designed to be used with a 12 V sealed battery as its power source. Do not use any other battery except for a 12 V sealed battery as a power source.
- Do not reverse the battery cable connections. This will damage the ECU.
- To prevent damage to the DFI parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- When charging, remove the battery from the motorcycle. This is to prevent ECU damage by excessive voltage.

- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition switch, and disconnect the battery (–) terminal. Do not pull the lead, only the connector. Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- Connect these connectors until they click [A].



- Do not turn the ignition switch to ON while any of the DFI electrical connectors are disconnected. The ECU memorizes service codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the DFI system is not influenced by electric wave radiated from the antenna. Check operation of the system with the engine at idle. Locate the antenna as far as possible away from the ECU.
- When any fuel hose is disconnected, do not turn on the ignition switch. Otherwise, the fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if the pump is completely dry. This is to prevent pump seizure.
- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- When any fuel hose is disconnected, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and run the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.
- Run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.

DFI Servicing Precautions

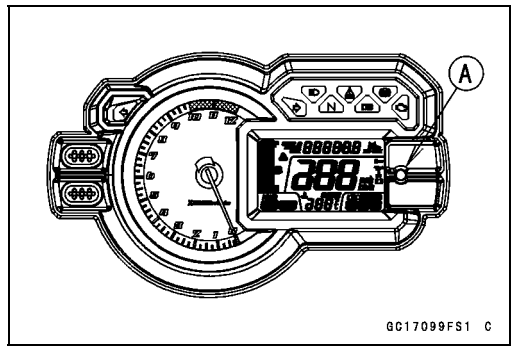
○If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak or the hose to burst. Remove the fuel tank (see Fuel Tank Removal) and check the fuel hose [A].

★Replace the fuel hose if any fraying, cracks or bulges are noticed.

○To maintain the correct fuel/air mixture (F/A), there must be no intake air leaks in the DFI system. Be sure to install the oil filler plug [A] after filling the engine oil.

Troubleshooting the DFI System

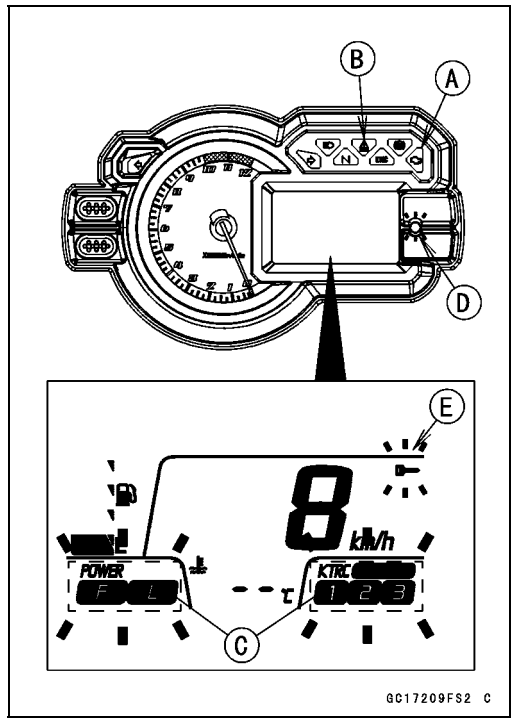
The red warning indicator light (LED) [A] is used for the immobilizer indicator (equipped model), battery warning indicator, oil pressure warning indicator and water temperature warning indicator.



Outline

When a problem occurs with DFI system, the yellow engine warning indicator light (LED) [A] goes on to alert the rider. In addition, the condition of the problem is stored in the memory of the ECU.

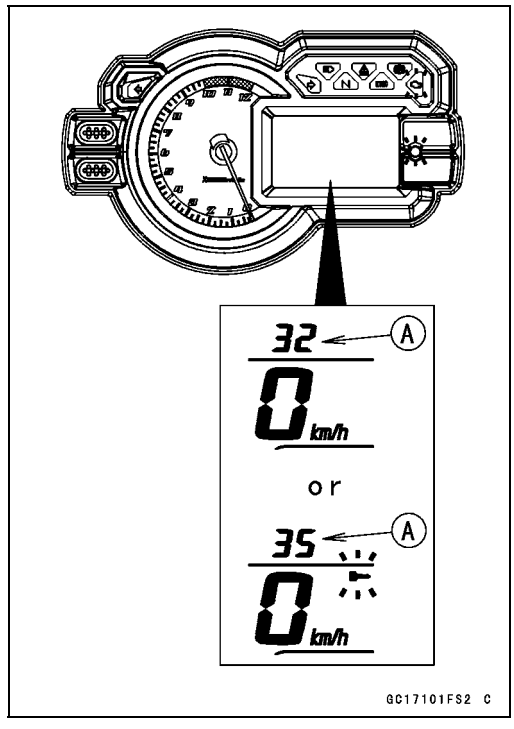
- When a problem occurs with KTRC system, the yellow KTRC warning indicator light (LED) [B] goes on, the KTRC and POWER mode symbols [C] blinking on the LCD.
- For models equipped with an immobilizer system, the red warning indicator light (LED) [D] and immobilizer warning symbol [E] blinks, when a problem occurs in the system.



With the engine stopped and turned in the self-diagnosis mode, the service code [A] is displayed on the LCD (Liquid Crystal Display) by the number of two digits.

If the problem is with the following parts, the ECU can not recognize these problem. Therefore, the yellow engine warning indicator light (LED) goes off or the red warning indicator light (LED) and immobilizer warning symbol do not blinks, and service code is not displayed.

LCD for Meter Unit
Fuel Pump
Fuel Pump Relay
Fuel Injectors
Stick Coil Secondary Wiring and Ground Wiring
ECU Main Relay
ECU Power Source Wiring and Ground Wiring

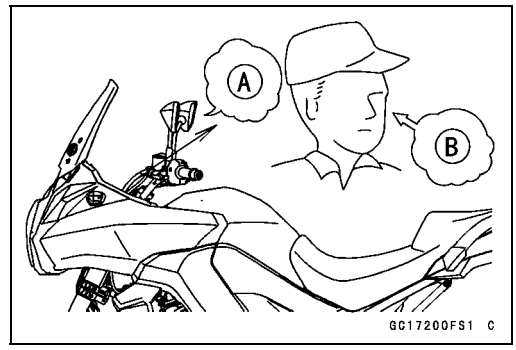


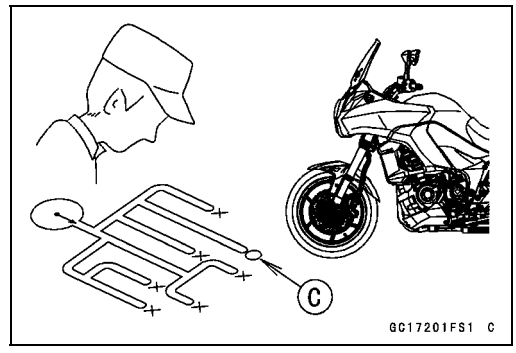
Troubleshooting the DFI System

When the service code [A] is displayed, for first ask the rider about the conditions [B] of trouble, and then start to determine the cause [C] of problem.

As a pre-diagnosis inspection, check the ECU for ground and power supply, the fuel line for no fuel leaks, and for correct pressure. The pre-diagnosis items are not indicated by the yellow engine warning indicator light (LED).

Don't rely solely on the DFI self-diagnosis function, use common sense.





Even when the DFI system is operating normally, the yellow engine warning indicator light (LED) may blink under strong electrical interference. Additional measures are not required. Turn the ignition switch OFF to stop the indicator light and symbol.

If the yellow engine warning indicator light (LED) of the motorcycle brought in for repair still blinks, check the service code.

When the repair has been done, the yellow engine warning indicator light (LED) goes off. But the service codes stored in memory of the ECU are not erased to preserve the problem history. The problem history can be referred using the KDS (Kawasaki Diagnostic System) when solving unstable problems.

When the motorcycle is down, the vehicle-down sensor operates and the ECU shuts off the fuel pump relay, fuel injectors and ignition system. The ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. When the starter button is pushed, the yellow engine warning indicator light (LED) blink but the service code is not displayed. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON.

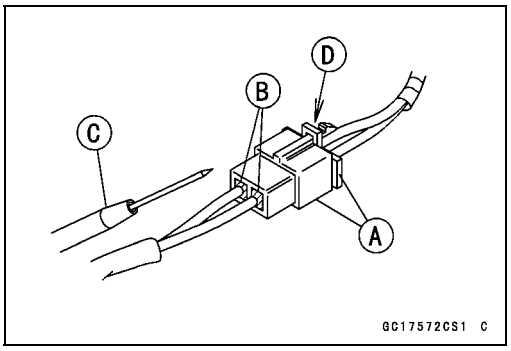
Much of the DFI system troubleshooting work consists of confirming continuity of the wiring. The DFI parts are assembled and adjusted with precision, and it is impossible to disassemble or repair them.

Troubleshooting the DFI System

- When checking the DFI parts, use a digital meter which can be read two decimal place voltage or resistance.

○The DFI part connectors [A] have seals [B], including the ECU. When measuring the input or output voltage with the connector joined, use the needle adapter set [C]. Insert the needle adapter inside the seal until the needle adapter reaches the terminal.

Special Tool - Needle Adapter Set: 57001-1457



NOTICE

Insert the needle adapter straight along the terminal in the connector to prevent short-circuit between terminals.

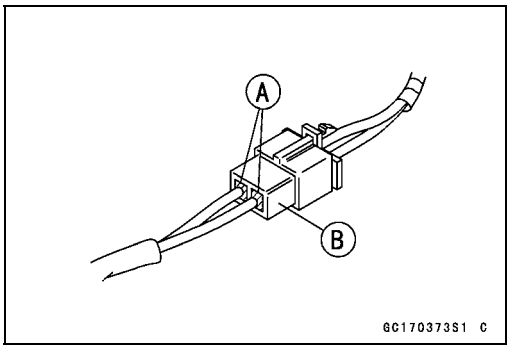
- Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of a digital meter.
- Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.
- Turn the ignition switch ON and measure the voltage with the connector joined.

NOTICE

Incorrect, reverse connection or short circuit by needle adapters could damage the DFI or electrical system parts.

○After measurement, remove the needle adapters and apply silicone sealant to the seals [A] of the connector [B] for waterproofing.

Sealant - Liquid Gasket, TB1211: 56019-120



- Always check battery condition before replacing the DFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.
- Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused by some other item or items, they too must be repaired or replaced, or the new replacement part will soon fail again.
- Measure coil winding resistance when the DFI part is cold (at room temperature).
- Make sure all connectors in the circuit are clean and tight, and examine leads for signs of burning, fraying, short, etc. Deteriorated leads and bad connections can cause reappearance of problems and unstable operation of the DFI system.

★If any wiring is deteriorated, replace the wiring.

Troubleshooting the DFI System

● Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.

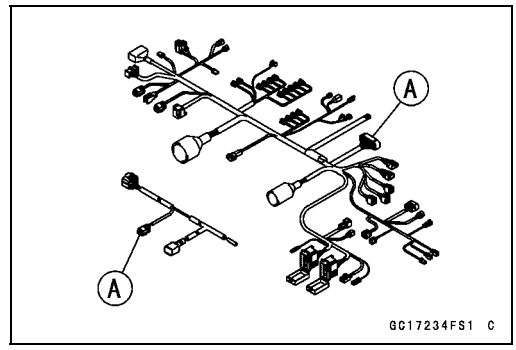
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.

● Check the wiring for continuity.

○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

○Connect the hand tester between the ends of the leads.

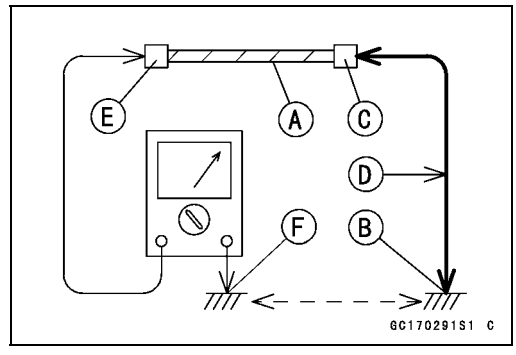
Special Tool - Hand Tester: 57001-1394



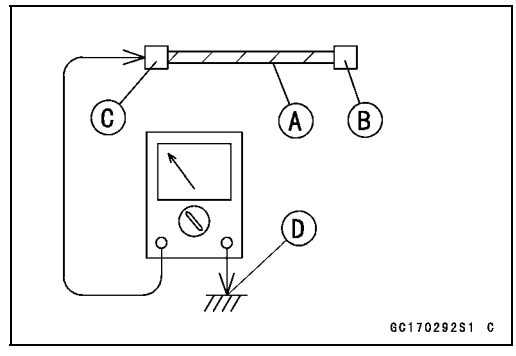
○Set the tester to the × 1 Ω range, and read the tester.

★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the main harness or the subharness.

○If both ends of a harness [A] are far apart, ground [B] the one end [C], using a jumper lead [D] and check the continuity between the end [E] and the ground [F]. This enables to check a long harness for continuity. If the harness is open, repair or replace the harness.



○When checking a harness [A] for short circuit, open one end [B] and check the continuity between the other end [C] and ground [D]. If there is continuity, the harness has a short circuit to ground, and it must be repaired or replaced.



● Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.

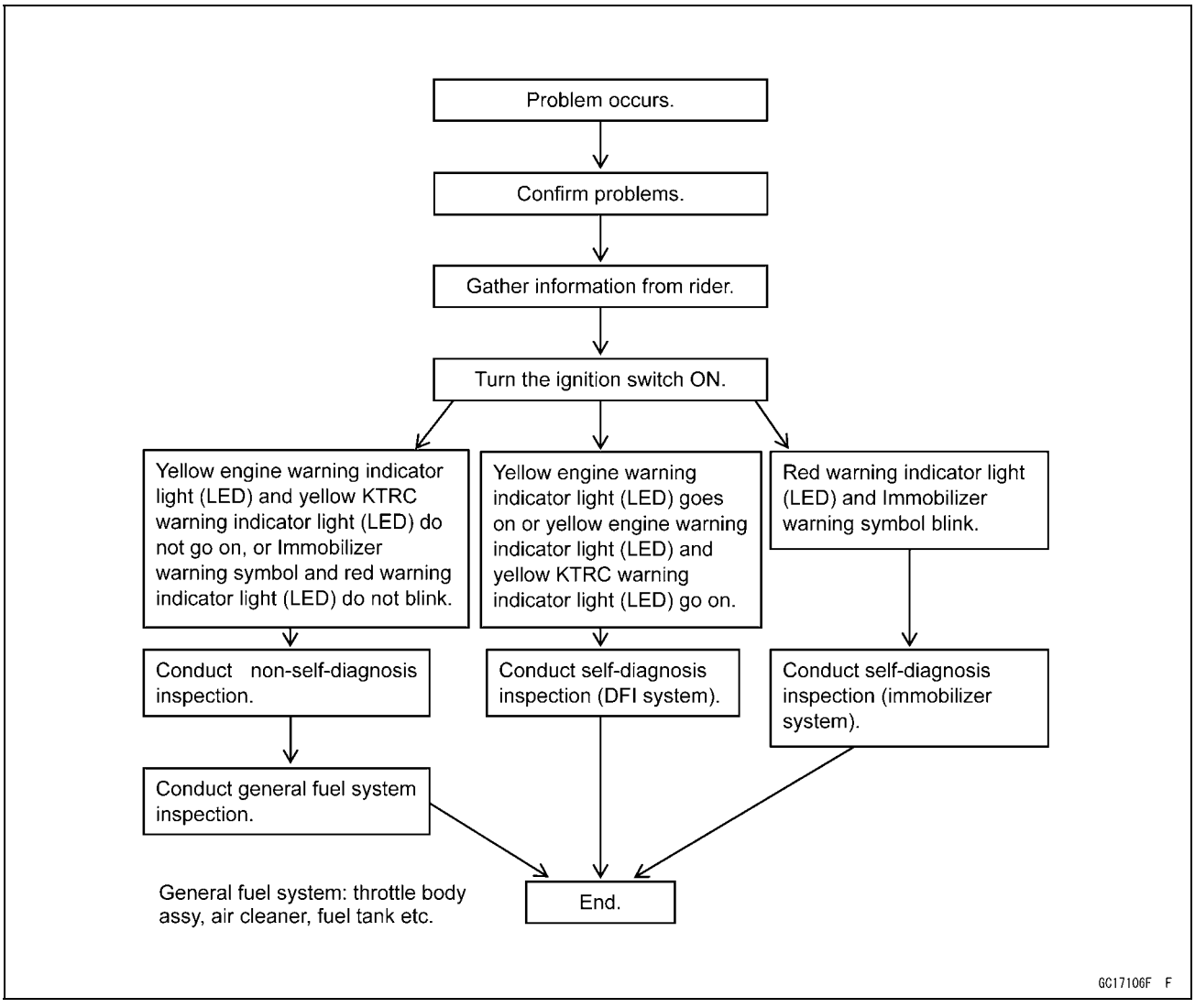
★If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.

★If an abnormality is found, replace the affected DFI part.

★If no abnormality is found in the wiring, connectors, and DFI parts, replace the ECU.

Troubleshooting the DFI System

DFI Diagnosis Flow Chart


Problem occurs.
Confirm problems.
Gather information from rider.
Turn the ignition switch ON.
Yellow engine warning indicator light (LED) and yellow KTRC warning indicator light (LED) do not go on, or Immobilizer warning symbol and red warning indicator light (LED) do not blink.
Yellow engine warning indicator light (LED) goes on or yellow engine warning indicator light (LED) and yellow KTRC warning indicator light (LED) go on.
Red warning indicator light (LED) and Immobilizer warning symbol blink.
Conduct non-self-diagnosis inspection.
Conduct self-diagnosis inspection (DFI system).
Conduct self-diagnosis inspection (immobilizer system).
Conduct general fuel system inspection.
General fuel system: throttle body assy, air cleaner, fuel tank etc.
End.
GC17106F F

Inquiries to Rider

○Each rider reacts to problems in different ways, so it is important to confirm what kind of symptoms the rider has encountered.

○Try to find out exactly what problem occurred under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem.

○The following sample diagnosis sheet will help prevent you from overlooking any areas, and will help you decide if it is a DFI system problem, or a general engine problem.

Troubleshooting the DFI System

Sample Diagnosis Sheet

Rider name:	**Registration No. (license plate No.):**	**Year of initial registration:**
Model:	**Engine No.:**	**Frame No.:**
Date problem occurred:		**Mileage:**
Environment when problem occurred.		
Weather	☐ fine, ☐ cloudy, ☐ rain, ☐ snow, ☐ always, ☐ other:	
Temperature	☐ hot, ☐ warm, ☐ cold, ☐ very cold, ☐ always, ☐ other:	
Problem frequency	☐ chronic, ☐ often, ☐once	
Road	☐ street, ☐ highway, ☐ mountain road (☐ uphill, ☐ downhill), ☐ bumpy, ☐ pebble	
Altitude	☐ normal, ☐ high (about 1 000 m or more)	
Motorcycle conditions when problem occurred.		
Yellow engine warning indicator light (LED) and yellow KTRC warning indicator light (LED)	☐ lights go on immediately after ignition switch ON, and go off after 1 ~ 2 seconds (normal).	
	☐ light(s) go on after ignition switch ON [DFI (and KTRC) system problem].	
	☐ light(s) do not go on. (ECU or meter unit problem)	
	☐ sometimes light(s) go on. (probably wiring fault)	
Red warning indicator light (LED)	☐ starts go on about 3 seconds after from ignition switch ON, and goes off after engine pressure becomes high enough (with engine running).	
	☐ starts blinking about 3 seconds after from ignition switch ON, and the immobilizer warning symbol on the LCD starts blinking (immobilizer system problem).	
	☐ does not go on about 3 seconds after ignition switch ON (ECU or meter unit problem).	
	☐ light up (battery, oil pressure, water temperature or meter unit problem).	
Starting difficulty	☐ starter motor not rotating.	
	☐ starter motor rotating but engine do not turn over.	
	☐ starter motor and engine do not turn over.	
	☐ no fuel flow (☐ no fuel in tank, ☐ no fuel pump sound).	
	☐ no spark.	
	☐ other:	
Engine stalls	☐ right after starting.	
	☐ when opening throttle grip.	
	☐ when closing throttle grip.	
	☐ when moving off.	
	☐ when stopping the motorcycle.	
	☐ when cruising.	
	☐ other:	

Troubleshooting the DFI System

Poor running at low speed	☐ very low idle speed, ☐ very high idle speed, ☐ rough idle speed.
	☐ battery voltage is low (charge the battery).
	☐ spark plug loose (tighten it).
	☐ spark plug dirty, broken, or gap maladjusted (remedy it).
	☐ backfiring.
	☐ afterfiring.
	☐ hesitation when acceleration.
	☐ engine oil viscosity too high.
	☐ brake dragging.
	☐ engine overheating.
	☐ clutch slipping.
	☐ other:
Poor running or no power at high speed	☐ spark plug loose (tighten it).
	☐ spark plug dirty, broken, or gap maladjusted (remedy it).
	☐ spark plug incorrect (replace it).
	☐ knocking (fuel poor quality or incorrect, → use high-octane gasoline).
	☐ brake dragging.
	☐ clutch slipping.
	☐ engine overheating.
	☐ engine oil level too high.
	☐ engine oil viscosity too high.
	☐ other:

DFI System Troubleshooting Guide

NOTE

○*This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties in DFI system.*

○*The ECU may be involved in the DFI electrical and ignition system troubles. If these parts and circuits are checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.*

Engine Won't Turn Over

Symptoms or Possible Causes	Actions (chapter)
Neutral, starter lockout or sidestand switch trouble	Inspect each switch (see chapter 16).
Immobilizer system trouble (Equipped Model)	Inspect (see chapter 3).
Vehicle-down sensor operated	Turn ignition switch OFF (see chapter 3).
Vehicle-down sensor trouble	Inspect (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 16).
Stick coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU ground and power supply trouble	Inspect (see chapter 3).
ECU trouble	Inspect (see chapter 3).
No or little fuel in tank	Supply fuel (see Owner's Manual).
Fuel injector trouble	Inspect and replace (see chapter 3).
Fuel pump not operating	Inspect (see chapter 3).
Fuel pump relay trouble	Inspect and replace (see chapter 16).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).

Poor Running at Low Speed

Symptoms or Possible Causes	Actions (chapter)
Spark weak:	
Stick coil shorted or not in good contact	Inspect or reinstall (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU trouble	Inspect (see chapter 3).
Fuel/air mixture incorrect:	
Little fuel in tank	Supply fuel (see Owner's Manual).
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 2).
Air duct loose	Reinstall (see chapter 3).
Throttle body assy holder loose	Reinstall (see chapter 3).
Throttle body assy dust seal damage	Replace (see chapter 3).
Fuel injector O-ring damage	Replace (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Unstable (rough) idling:	
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Engine vacuum not synchronizing	Inspect and adjust (see chapter 2).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Engine stalls easily:	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Stick coil trouble	Inspect (see chapter 16).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Poor acceleration:	
Fuel pressure too low	Inspect (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Stick coil trouble	Inspect (see chapter 16).
Stumble:	
Fuel pressure too low	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Surge:	
Unstable fuel pressure	Fuel pressure regulator trouble (Inspect and replace fuel pump) or kinked fuel line (Inspect and replace fuel pump) (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Backfiring when deceleration:	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Fuel pressure too low	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Air switching valve trouble	Inspect and replace (see chapter 16).
Air suction valve trouble	Inspect and replace (see chapter 5).
After fire:	
Spark plug burned or gap maladjusted	Replace (see chapter 2).
Fuel injector trouble	Inspect (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Other:	
Intermittent any DFI fault and its recovery	Check that DFI connectors are clean and tight, and examine leads for signs of burning or fraying (see chapter 3).

Poor Running or No Power at High Speed

Symptoms or Possible Causes	Actions (chapter)
Firing incorrect:	
Stick coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU trouble	Inspect (see chapter 3).
Fuel/air mixture incorrect:	
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 2).
Air duct loose	Reinstall (see chapter 3).
Throttle body assy holder loose	Reinstall (see chapter 3).
Throttle body assy dust seal damage	Replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel injector O-ring damage	Replace (see chapter 3).
Fuel injector clogged	Inspect and repair (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pump operates intermittently and often ECU fuse blows.	Fuel pump bearings may wear. Replace the fuel pump (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Cracked or obstructed intake air pressure sensor hose	Inspect and repair or replace (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Knocking:	
Fuel poor quality or incorrect	Fuel change (Use the gasoline recommended in the Owner's Manual).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
Stick coil trouble	Inspect (see chapter 16).
ECU trouble	Inspect (see chapter 3).
Engine vacuum not synchronizing	Inspect and adjust (see chapter 2).
Intake air pressure sensor #1 trouble	Inspect (see chapter 3).
Intake air pressure sensor #2 trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Intake air temperature sensor trouble	Inspect (see chapter 3).
Miscellaneous:	
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Rear wheel rotation sensor trouble	Inspect (see chapter 12).
Throttle valves will not fully open	Inspect throttle cables and lever linkage (see chapter 3).
Engine overheating - Water temperature sensor, crankshaft sensor or speed sensor trouble	(see Overheating of Troubleshooting Guide in chapter 17)
Air switching valve trouble	Inspect and replace (see chapter 16).
Air suction valve trouble	Inspect and replace (see chapter 5).
Exhaust Smokes Excessively:	
(Black smoke)	
Air cleaner element clogged	Clean element (see chapter 2).
Fuel pressure too high	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
(Brown smoke)	
Air duct loose	Reinstall (see chapter 3).
Fuel pressure too low	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).

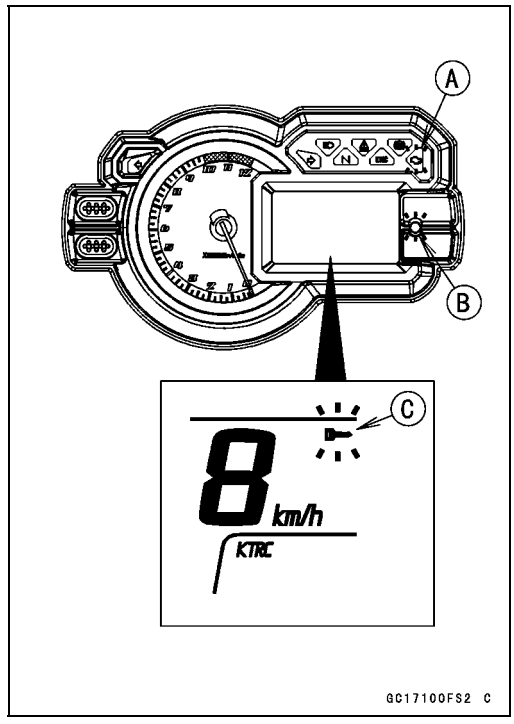
Self-Diagnosis

Self-diagnosis Outline

The self-diagnosis system has two modes and can be switched to another mode by operating the meter unit.

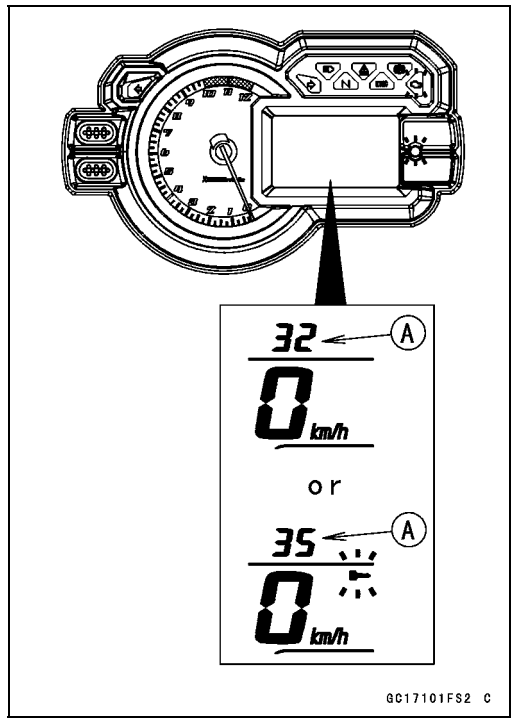
User Mode

The ECU notifies the rider of troubles in DFI system, ignition system and immobilizer system by goes on or blinking the yellow engine warning indicator light (LED) [A] or red warning indicator light (LED) [B] and immobilizer warning symbol [C] when DFI, ignition and immobilizer system parts are faulty, and initiates fail-safe function. In case of serious troubles ECU stops the injection and ignition operations.



Dealer Mode

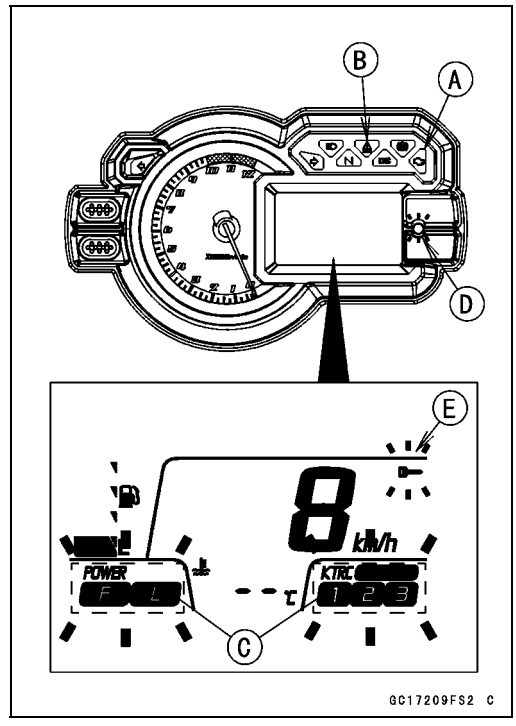
The LCD (Liquid Crystal Display) display the service code(s) [A] to show the problem(s) which the DFI system, ignition system and immobilizer system has at the moment of diagnosis.



Self-Diagnosis

Self-diagnosis Procedures

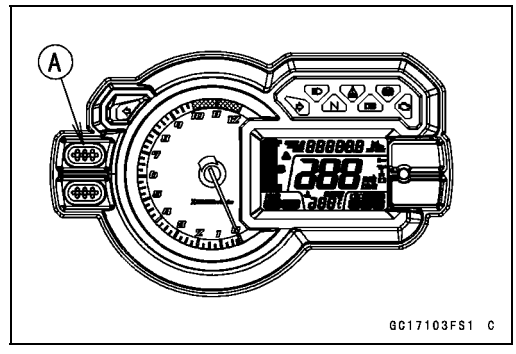
○When a problem occurs with the DFI system and ignition system, the yellow engine warning indicator light (LED) [A] goes on.
○When a problem occurs with KTRC system, the yellow KTRC warning indicator light (LED) [B] goes on, the KTRC and POWER mode symbols [C] blinking on the LCD.
○For models equipped with an immobilizer system, when a problem occurs with the system, the red warning indicator light (LED) [D] and immobilizer warning symbol [E] blink.



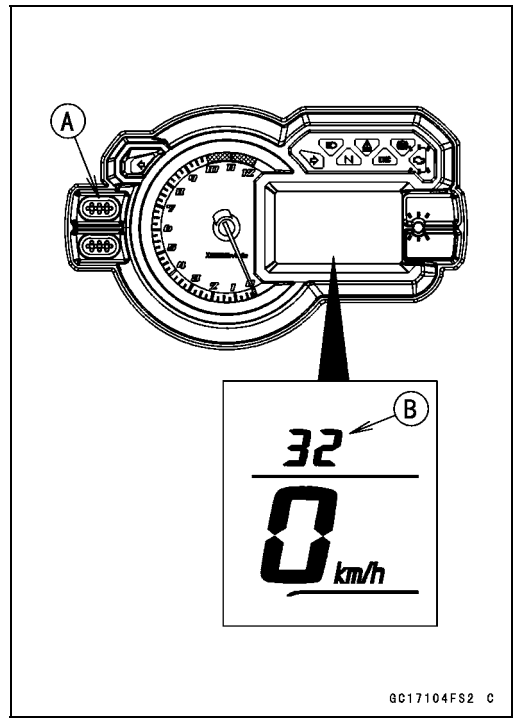
NOTE

○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the yellow engine warning light (LED) or red warning indicator light (LED) and symbol blink very slowly or do not blink.*

● Turn the ignition switch to ON.
● Push the upper button [A] to display the odometer.



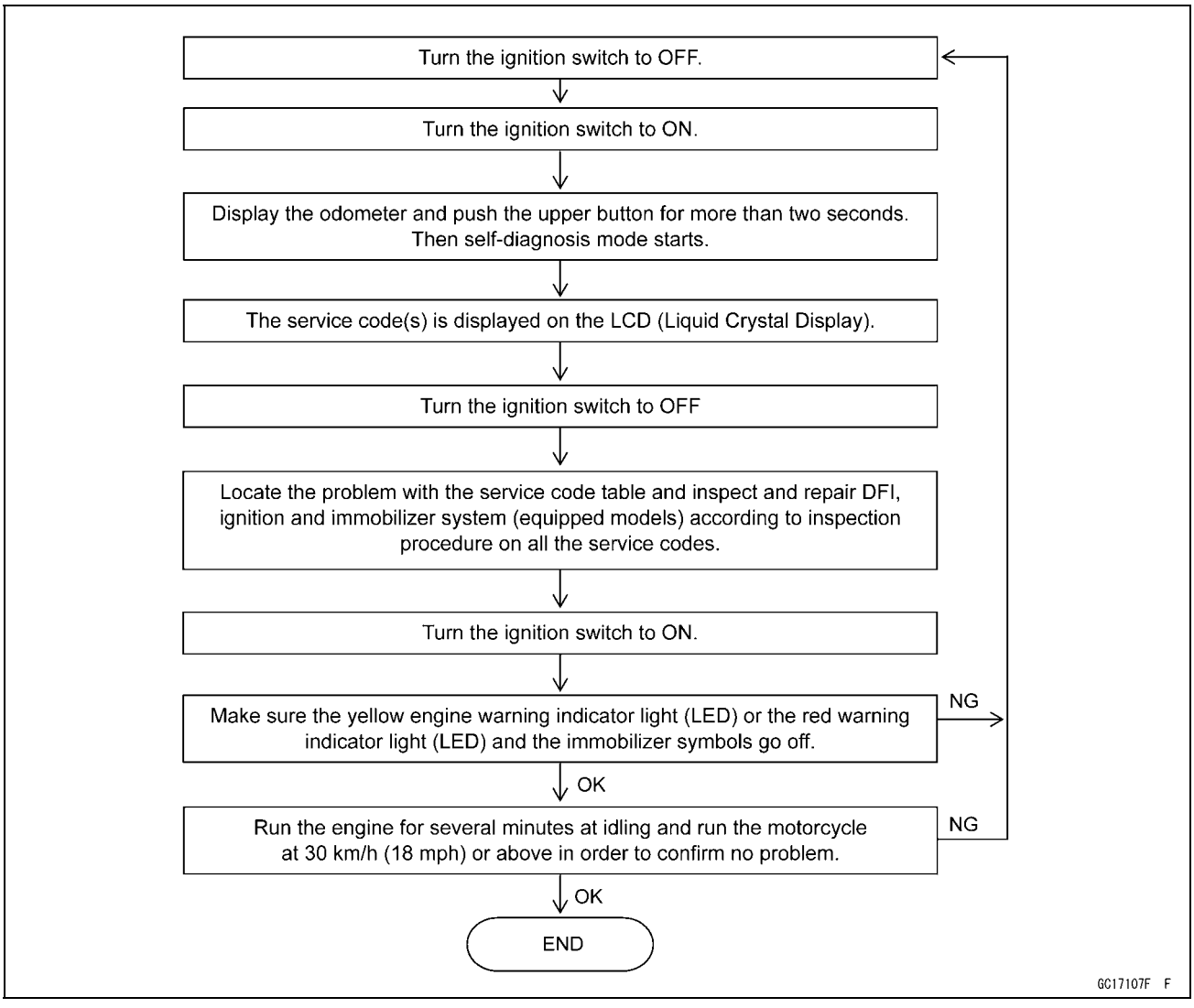
● Push the upper button [A] for more than two seconds.
● The service code [B] is displayed on the LCD by the number of two digits.



Self-Diagnosis

● Any of the following procedures ends self-diagnosis.
○When the service code is displayed on the LCD, push the upper button for more than two seconds.
○When the ignition switch is turned OFF.

Self-Diagnosis Flow Chart


Turn the ignition switch to OFF.
Turn the ignition switch to ON.
Display the odometer and push the upper button for more than two seconds. Then self-diagnosis mode starts.
The service code(s) is displayed on the LCD (Liquid Crystal Display).
Turn the ignition switch to OFF
Locate the problem with the service code table and inspect and repair DFI, ignition and immobilizer system (equipped models) according to inspection procedure on all the service codes.
Turn the ignition switch to ON.
Make sure the yellow engine warning indicator light (LED) or the red warning indicator light (LED) and the immobilizer symbols go off.
NG
OK
Run the engine for several minutes at idling and run the motorcycle at 30 km/h (18 mph) or above in order to confirm no problem.
NG
OK
END
GC17107F F

Self-Diagnosis

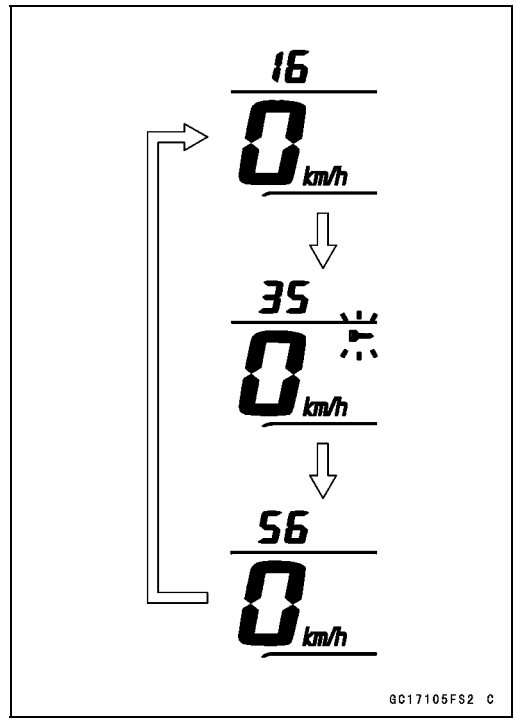
Service Code Reading

○The service code(s) is displayed on the LCD by the number of two digits.

○When there are a number of problems, all the service codes can be stored and the display will begin starting from the lowest number service code in the numerical order.

○Then after completing all codes, the display is repeated until the ignition switch is turned OFF or upper button is pushed for more than two seconds.

○For example, if three problems occurred in the order of 56, 16, 35, the service codes are displayed (each two seconds) from the lowest number in the order listed as shown below. (16→35→56)→(16→35→56)→· · ·(repeated)



○If there is no problem or when the repair has been done, yellow engine warning indicator light (LED) or red warning indicator light (LED) and immobilizer symbols go off and service code is not displayed.

Service Code Erasing

○When repair has been done, yellow engine warning indicator light (LED) or red warning indicator light (LED) and immobilizer warning symbols go off and service code is not displayed.

★But the service codes stored in memory of the ECU are not erased to preserve the problem history. In this model, the problem history can not be erased.

Self-Diagnosis

Service Code Table

Service Code	System	Problems
11	FI/KTRC	Main throttle sensor malfunction, wiring open or short
12	FI/KTRC	Intake air pressure sensor #1 malfunction, wiring open or short
13	FI	Intake air temperature sensor malfunction, wiring open or short
14	FI	Water temperature sensor malfunction, wiring open or short
16	FI	Intake air pressure sensor #2 malfunction, wiring open or short
21	FI/KTRC	Crankshaft sensor malfunction, wiring open or short
24	FI/KTRC	Rear wheel rotation sensor malfunction, wiring open or short
27	KTRC	Front wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing, wiring open)
31	FI	Vehicle-down sensor malfunction, wiring open or short
32	FI/KTRC	Subthrottle sensor malfunction, wiring open or short
33	FI	Oxygen sensor inactivation, wiring open or short
35	Immobilizer	Immobilizer amplifier malfunction (Equipped Model)
36	Immobilizer	Blank Key detection (Equipped Model)
39	ECU/Wiring	ECU communication error
51	FI/KTRC	Stick coil #1 malfunction, wiring open or short
52	FI/KTRC	Stick coil #2 malfunction, wiring open or short
53	FI/KTRC	Stick coil #3 malfunction, wiring open or short
54	FI/KTRC	Stick coil #4 malfunction, wiring open or short
56	FI	Radiator fan relay malfunction, wiring open or short
62	FI/KTRC	Subthrottle valve actuator malfunction, wiring open or short
64	FI	Air switching valve malfunction, wiring open or short
67	FI	Oxygen sensor heater malfunction, wiring open or short
94	FI	Oxygen sensor malfunction, wiring open or short

Notes:

- The ECU may be involved in these problems. If all the parts and circuits checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.
- When no service code is displayed, the electrical parts of the DFI system has no fault, and the mechanical parts of the DFI system and the engine are suspect.

Self-Diagnosis

Backups

○The ECU takes the following measures to prevent engine damage when the DFI, ignition or immobilizer system parts have troubles.

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Main Throttle Sensor	Output Voltage 0.2 ~ 4.8 V	If the main throttle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method (1).
12	Intake Air Pressure Sensor #1	Intake Air Pressure (Absolute) Pv = 100 ~ 900 mmHg	If the intake air pressure sensor #1 system fails (the signal is out of the usable range, wiring short or open), the ECU sets the DFI in the α-N method (2).
13	Intake Air Temperature Sensor	Intake Air Temperature Ta = – 47 ~ + 178°C	If the intake air temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 40°C.
14	Water Temperature Sensor	Water Temperature Tw = – 30 ~ + 120°C	If the water temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Tw at 80°C and radiator fan operates.
16	Intake Air Pressure Sensor #2	Atmospheric Pressure (Absolute) Pa = 100 ~ 900 mmHg	If the intake air pressure sensor #2 system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pa at 760 mmHg (the standard atmospheric pressure).
21	Crankshaft Sensor	Crankshaft sensor must send 22 signals to the ECU at the 1 cranking.	If the crankshaft sensor generates less than 22 or more signals, the engine stops by itself.
24	Rear Wheel Rotation Sensor	Rear wheel rotation sensor must send 45 signals to the ECU at the 1 rotation of the wheel.	If the rear wheel rotation sensor system fails (the signal is missing, wiring open), the ECU stops the KTRC control.
27	Front Wheel Rotation Sensor Signal	Front wheel rotation sensor must send 48 signals to the ECU at the 1 rotation of the wheel.	If the front wheel rotation sensor system fails (the signal is missing, wiring open), the ECU stops the KTRC control.
31	Vehicle -down Sensor	Output Voltage 0.10 ~ 4.84 V	If the vehicle-down sensor system has failures (the output voltage is out of the usable range, wiring short or open), the ECU shuts off the fuel pump relay, the fuel injectors and the ignition system.
32	Subthrottle Sensor	Output Voltage 0.15 ~ 4.85 V	If the subthrottle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU drive the subthrottle valve to the full closed position, and it stops the current to the subthrottle valve actuator.
33	Oxygen Sensor	The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU.	If the oxygen sensor is not activated, the ECU stops the feedback mode of the oxygen sensor.

Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
35	Immobilizer Amplifier (Equipped Model)	–	If the immobilizer system fails (no signal, wiring short or open), the vehicle is no start and run.
36	Ignition Key (Equipped Model)	The ignition key must use register key.	If the blank key or broken key is used, the vehicle is no start and run.
39	ECU	The ECU send the data (for service code and key registration) to the meter unit.	–
51	Stick Coil #1*	The ECU sends signals (output voltage) continuously to the stick coil.	If the stick coil #1 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running.
52	Stick Coil #2*	The ECU sends signals (output voltage) continuously to the stick coil.	If the stick coil #2 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running.
53	Stick Coil #3*	The ECU sends signals (output voltage) continuously to the stick coil.	If the stick coil #3 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #3 to stop fuel to the cylinder #3, though the engine keeps running.
54	Stick Coil #4*	The ECU sends signals (output voltage) continuously to the stick coil.	If the stick coil #4 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #4 to stop fuel to the cylinder #4, though the engine keeps running.
56	Radiator Fan Relay	When the relay OFF condition, the fan relay is open.	–
62	Subthrottle Valve Actuator	The actuator operates open and close of the subthrottle valve by the pulse signal from the ECU.	If the subthrottle valve actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator.
64	Air Switching Valve	The air switching valve controls the flow of the secondary air by opening and shutting the solenoid valve.	–
67	Oxygen Sensor Heater	The oxygen sensor heater raise temperature of the sensor for its earlier activation.	If the oxygen sensor heater fails (wiring short or open), the ECU stops the current to the heater, and it stops the feedback mode of the oxygen sensor.
94	Oxygen Sensor	The oxygen sensor must send signals (output voltage) continuously to the ECU	If the oxygen sensor output voltage is incorrect, the ECU stops the feedback mode of the oxygen sensor.

Self-Diagnosis

Note:

(1) D-J Method: The DFI control method from medium to heavy engine load. When the engine load is light like at idling or low speed, the ECU determines the injection quantity by calculating from the throttle vacuum (intake air pressure sensor output voltage) and engine speed (crankshaft sensor output voltage). This method is called D-J method.

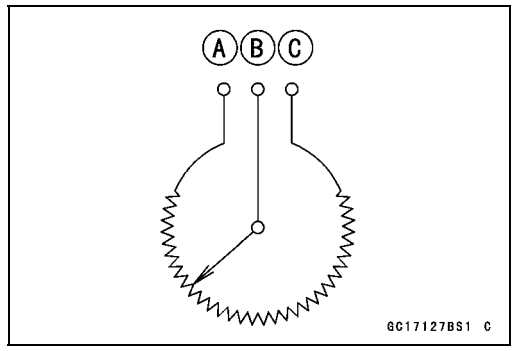
(2) α-N Method: As the engine speed increases, and the engine load turns middle to heavy, the ECU determines the injection quantity by calculating from the throttle opening (main throttle sensor output voltage) and the engine speed. This method is called α-N method.

*: This depends on the number of stopped cylinders.

Main Throttle Sensor (Service Code 11)

The main throttle sensor is a rotating variable resistor that change output voltage according to throttle operating. The ECU senses this voltage change and determines fuel injection quantity, and ignition timing according to engine rpm, and throttle opening.

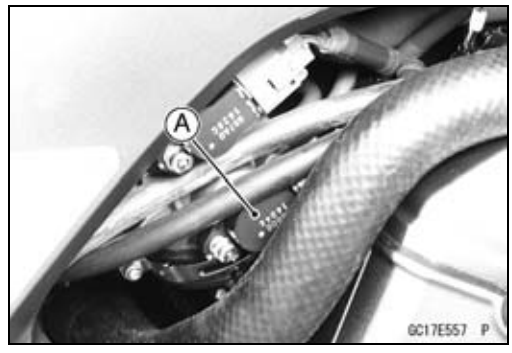
Input Terminal [A]
Output Terminal [B]
Ground Terminal [C]



Main Throttle Sensor Removal/Adjustment

NOTICE

Do not remove or adjust the main throttle sensor [A] since it has been adjusted and set with precision at the factory.
Never drop the throttle body assy especially on a hard surface. Such a shock to the main throttle sensor can damage it.



Main Throttle Sensor Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the main throttle sensor connector and connect the throttle sensor setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

- Connect a digital meter to the throttle sensor setting adapter leads.

Main Throttle Sensor Input Voltage
Connections to Adapter:
Digital Meter (+) → W (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Input Voltage
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch to OFF.

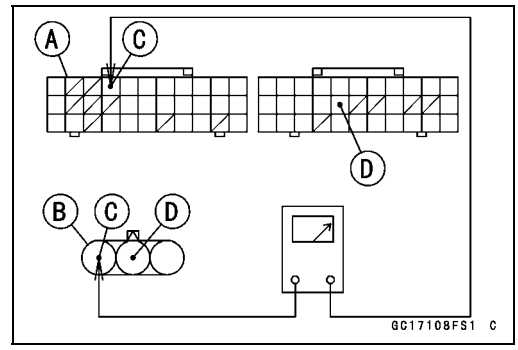
★If the reading is within the standard, check the output voltage (see Main Throttle Sensor Output Voltage Inspection).

Main Throttle Sensor (Service Code 11)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

Wiring Inspection
ECU Connector [A] ←→
Main Throttle Sensor Connector [B]
BL lead (ECU terminal 4) [C]
G lead (ECU terminal 49) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Main Throttle Sensor Output Voltage Inspection

● Measure the output voltage at the main throttle sensor in the same way as input voltage inspection, note the following.

○Disconnect the main throttle sensor connector and connect the throttle sensor setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

Main Throttle Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor Y/W) lead
Digital Meter (–) → BK (sensor G) lead

● Start the engine and warm it up thoroughly.

● Check idle speed to ensure the throttle opening is correct.

Idle Speed
Standard: 1 100 ±50 r/min (rpm)

★If the idle speed is out of the specified range, adjust it (see Idle Speed Inspection in the Periodic Maintenance chapter).

Main Throttle Sensor (Service Code 11)

- Turn the ignition switch to OFF.
- Measure the output voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Output Voltage
Standard: DC 1.02 ~ 1.06 V at idle throttle opening
DC 4.22 ~ 4.42 V at full throttle opening (for reference)

NOTE

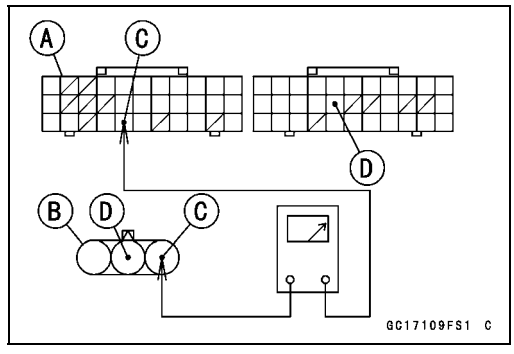
○*Open the throttle, confirm the output voltage will be raise.*
○*The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
Example:
In the case of a input voltage of 4.75 V.
1.02 × 4.75 ÷ 5.00 = 0.969 V
1.06 × 4.75 ÷ 5.00 = 1.007 V
Thus, the valid range is 0.969 ~ 1.007 V

- Turn the ignition switch to OFF.

★If the reading is out of the standard, check the main throttle sensor resistance (see Main Throttle Sensor Resistance Inspection).

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
○Disconnect the ECU and sensor connectors.

Wiring Inspection
ECU Connector [A] ←→
Main Throttle Sensor Connector [B]
Y/W lead (ECU terminal 27) [C]
G lead (ECU terminal 49) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Main Throttle Sensor (Service Code 11)

Main Throttle Sensor Resistance Inspection

- Turn the ignition switch to OFF.
- Disconnect the main throttle sensor connector.

○Disconnect the main throttle sensor connector and connect the throttle sensor setting adapter [A] to the sensor connector only.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

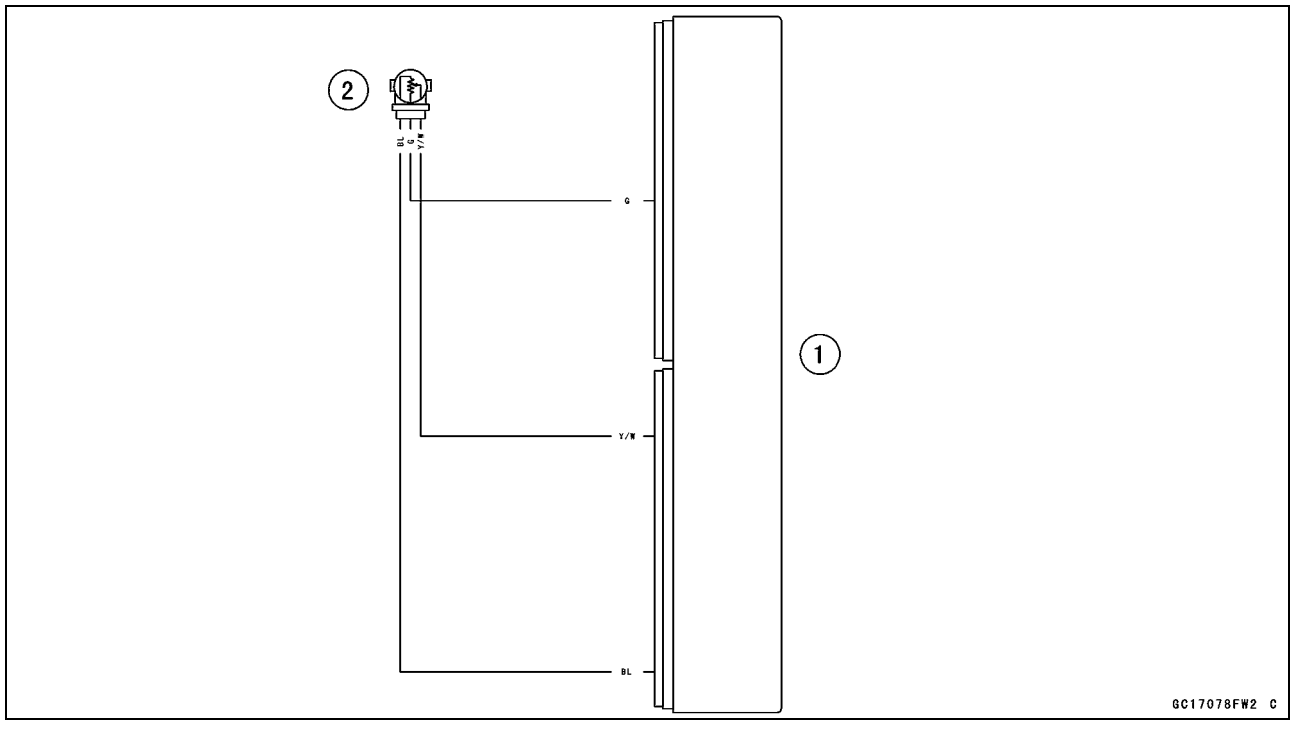
Main Throttle Sensor Resistance
Connections to Adapter:
Digital Meter (+) → W (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead

Standard: 4 ~ 6 kΩ

★If the reading is out of the standard, replace the throttle body assy.

★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

Main Throttle Sensor Circuit



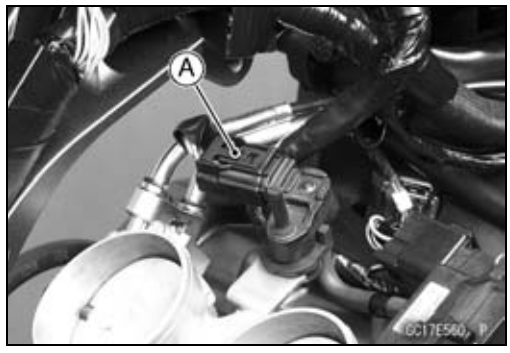
1. ECU
2. Main Throttle Sensor

Intake Air Pressure Sensor #1 (Service Code 12)

Intake Air Pressure Sensor #1 Removal

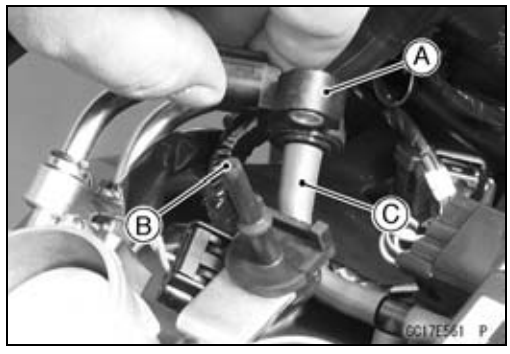
NOTICE

Never drop the intake air pressure sensor #1 especially on a hard surface. Such a shock to the sensor can damage it.



● Remove:
Air Cleaner Housing (see Air Cleaner Housing Removal)
Intake Air Pressure Sensor #1 Connector [A]

● Remove the intake air pressure sensor #1 [A] from the rubber damper [B] in the bracket and separate the vacuum hose [C].



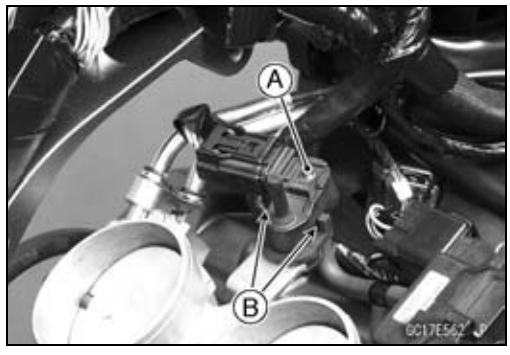
Intake Air Pressure Sensor #1 Installation

NOTE

○*The intake air pressure sensor #1 is the same part as the intake air pressure sensor #2.*

● Installation is the reverse of removal.

○Position the intake air pressure sensor #1 [A] between the projections [B] on the rubber damper.



Intake Air Pressure Sensor #1 (Service Code 12)

Intake Air Pressure Sensor #1 Input Voltage Inspection

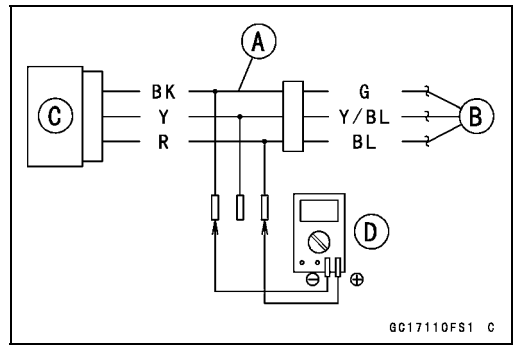
NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the intake air pressure sensor #1 connector and connect the measuring adapter [A] between these connectors.
  [B] Main Harness
  [C] Intake Air Pressure Sensor #1

Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter [D] to the measuring adapter leads.



Intake Air Pressure Sensor #1 Input Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead

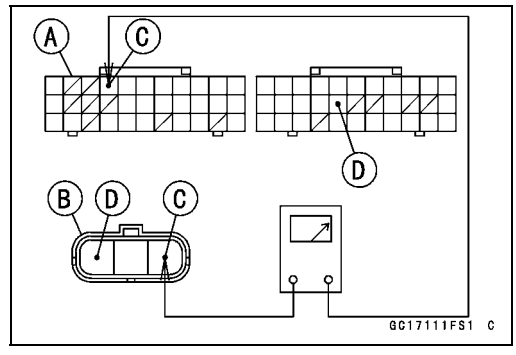
- Measure the intake voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Input Voltage
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch to OFF.

★If the reading is within the standard, check the output voltage (see Intake Air Pressure Sensor #1 Output Voltage Inspection).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.



Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Pressure Sensor #1 Connector [B]
BL lead (ECU terminal 4) [C]
G lead (ECU terminal 49) [D]

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Intake Air Pressure Sensor #1 (Service Code 12)

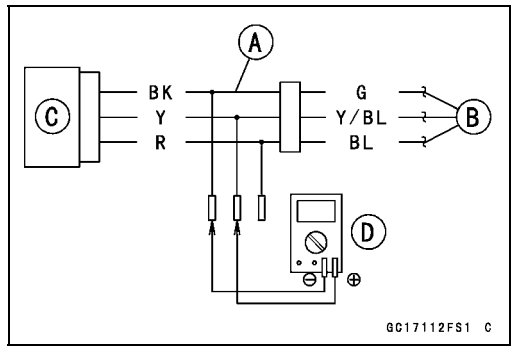
Intake Air Pressure Sensor #1 Output Voltage Inspection

● Measure the output voltage at the intake air pressure sensor #1 in the same way as input voltage inspection, note the following.

○Disconnect the intake air pressure sensor #1 connector and connect the measuring adapter [A] between these connectors.

[B] Main Harness
[C] Intake Air Pressure Sensor #1
[D] Digital Meter

Special Tool - Measuring Adapter: 57001-1700



Intake Air Pressure Sensor #1 Output Voltage
Connections to Adapter:
Digital Meter (+) → Y (sensor Y/BL) lead
Digital Meter (–) → BK (sensor G) lead

● Measure the output voltage with the engine stopped and with the connector joined.

● Turn the ignition switch to ON.

Output Voltage
Usable Range: DC 3.80 ~ 4.20 V at standard atmospheric pressure (101.32 kPa, 76 cmHg)

NOTE

○*The output voltage changes according to local atmospheric pressure.*

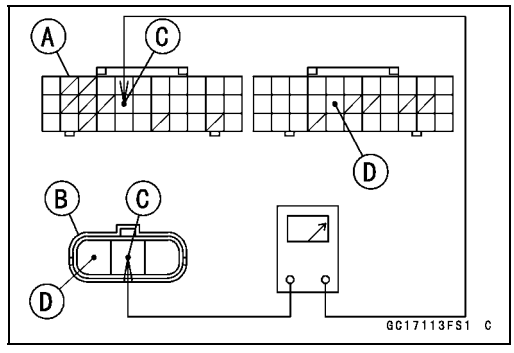
● Turn the ignition switch to OFF.

★If the reading is out of the usable range, replace the sensor.

★If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness connector.

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.



Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Pressure Sensor #1 Connector [B]
Y/BL lead (ECU terminal 18) [C]
G lead (ECU terminal 49) [D]

Intake Air Pressure Sensor #1 (Service Code 12)

★If the wiring is good, check the sensor for various vacuum.
- Remove the intake air pressure sensor #1 [A] and disconnect the vacuum hose from the sensor.
- Connect an auxiliary hose [B] to the intake air pressure sensor #1.
- Temporarily install the intake air pressure sensor #1.

○Connect a digital meter [C], vacuum gauge [D], the fork oil level gauge [E] and the measuring adapter to the intake air pressure sensor #1.

Special Tools - Fork Oil Level Gauge: 57001-1290
Vacuum Gauge: 57001-1369
Measuring Adapter: 57001-1700

Intake Air Pressure Sensor #1 Output Voltage
Connections to Adapter:
Digital Meter (+) → Y (sensor Y/BL) lead
Digital Meter (–) → BK (sensor G) lead

○Turn the ignition switch to ON.
○Measure the intake air pressure sensor #1 output voltage from various vacuum readings, while pulling the handle of the fork oil level gauge.
○Check the intake air pressure sensor #1 output voltage, using the following formula and chart.

Suppose:
Pg: Vacuum Pressure (Gauge) of Throttle Body
Pl: Local Atmospheric Pressure (Absolute) measured by a barometer
Pv: Vacuum Pressure (Absolute) of Throttle Body
Vv: Sensor Output Voltage (V)

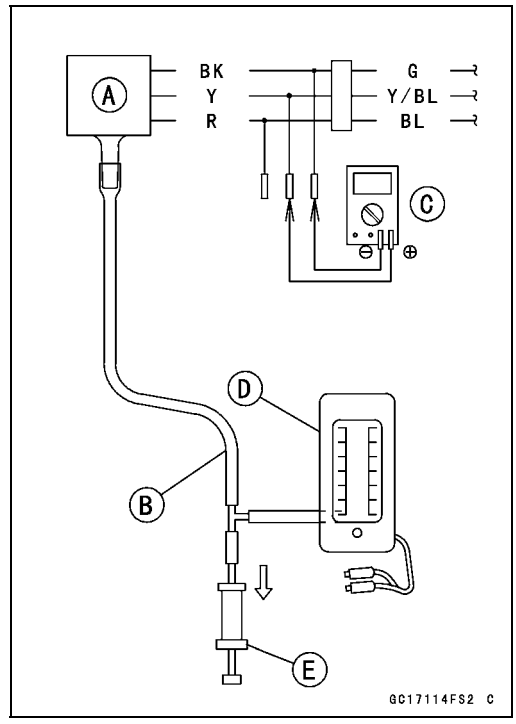
then
Pv = Pl – Pg

For example, suppose the following data is obtained:
Pg = 8 cmHg (Vacuum Gauge Reading)
Pl = 70 cmHg (Barometer Reading)
Vv = 3.2 V (Digital Meter Reading)

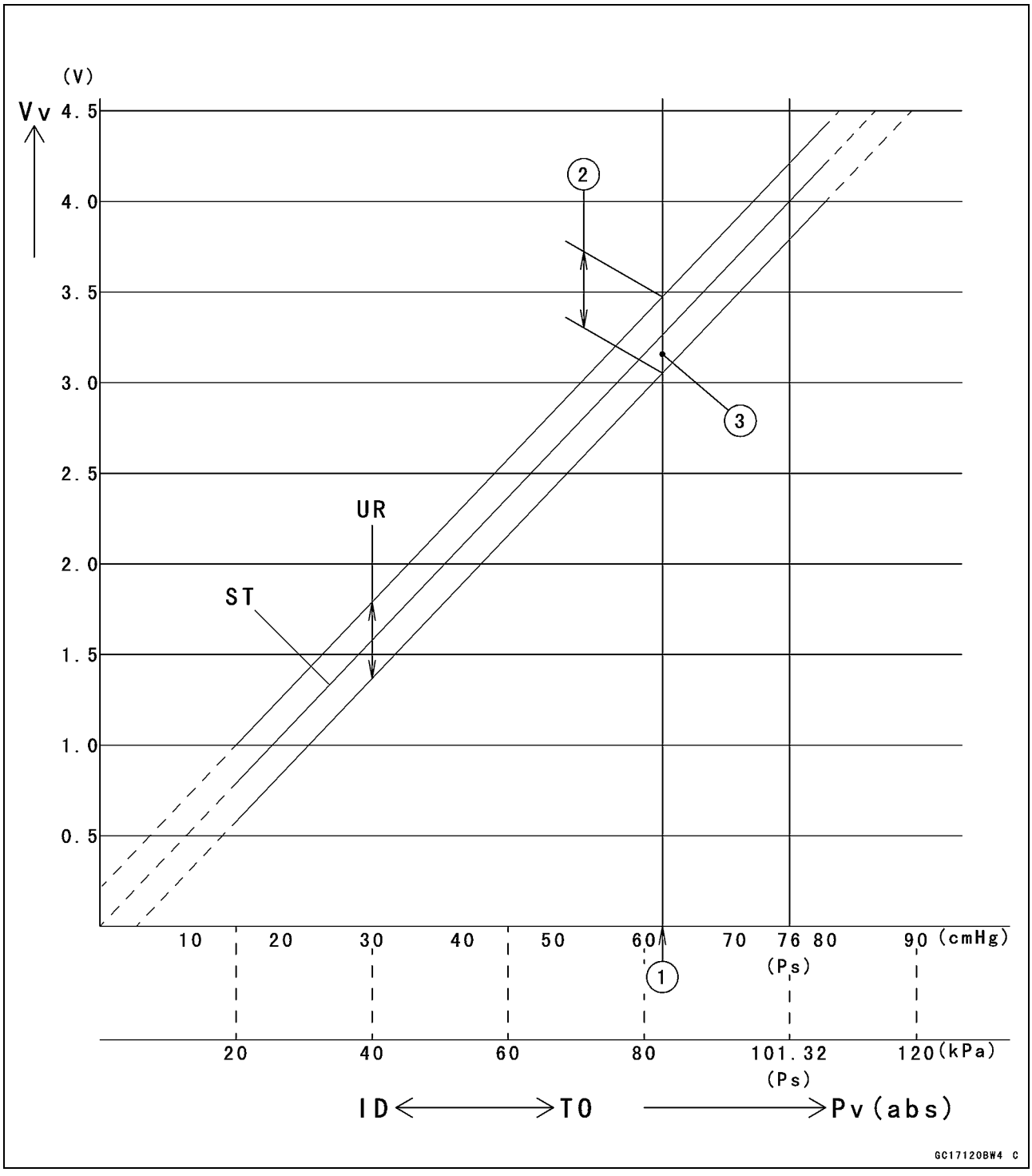
then
Pv = 70 – 8 = 62 cmHg (Absolute)

Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.
Usable range = 3.08 ~ 3.48 V
Plot Vv (3.2 V) on the vertical line. → Point [3].
Results: In the chart, Vv is within the usable range and the sensor is normal.

★If the reading is out of the usable range, replace the sensor.
★If the reading is within the usable range, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



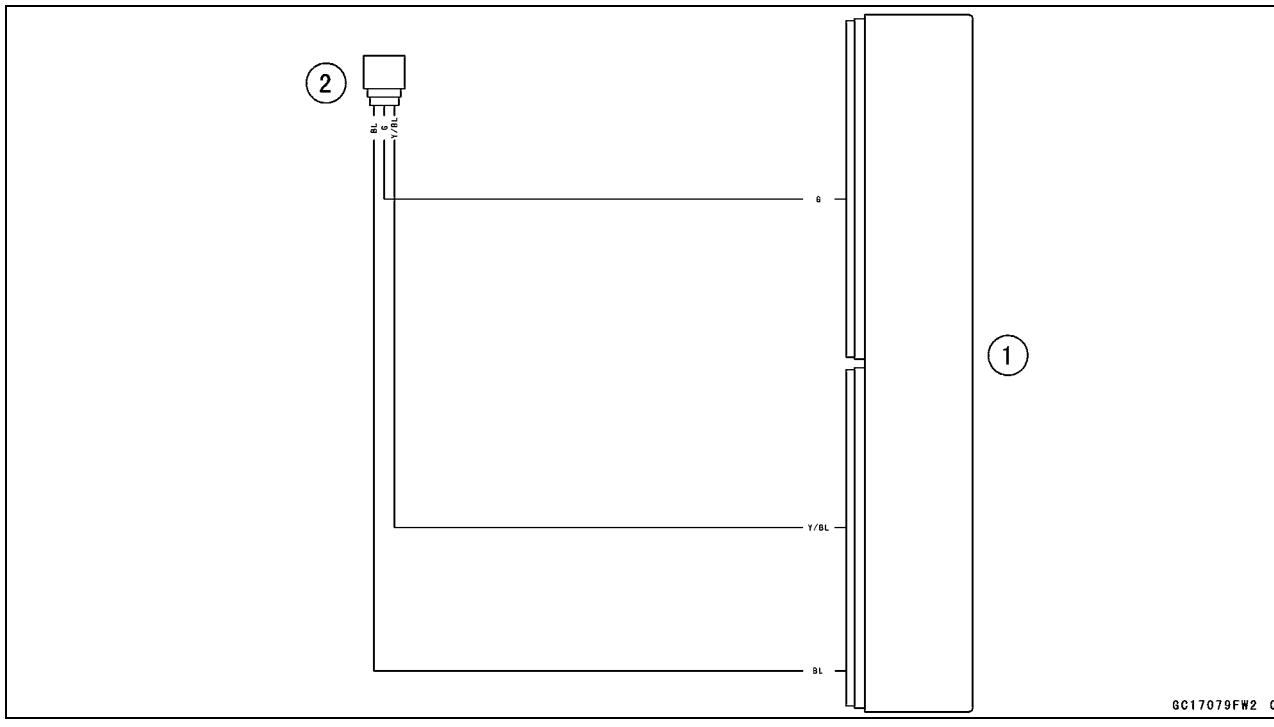
Intake Air Pressure Sensor #1 (Service Code 12)



ID: Idling
Ps: Standard Atmospheric Pressure (Absolute)
Pv: Throttle Vacuum Pressure (Absolute)
ST: Standard of Sensor Output Voltage (V)
TO: Throttle Full Open
UR: Usable Range of Sensor Output Voltage (V)
Vv: Intake Air Pressure Sensor #1 Output Voltage (V) (Digital Meter Reading)

Intake Air Pressure Sensor #1 (Service Code 12)

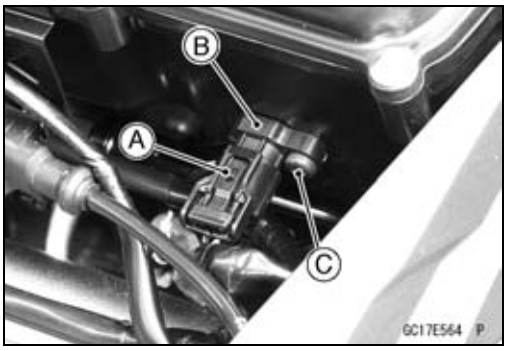
Intake Air Pressure Sensor #1 Circuit



1. ECU
2. Intake Air Pressure Sensor #1

Intake Air Temperature Sensor (Service Code 13)

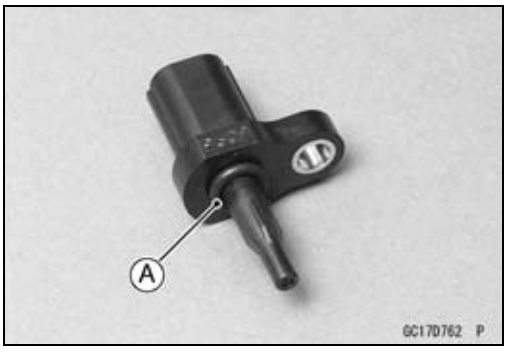
Intake Air Temperature Sensor Removal/Installation



NOTICE

Never drop the intake air temperature sensor especially on a hard surface. Such a shock to the sensor can damage it.

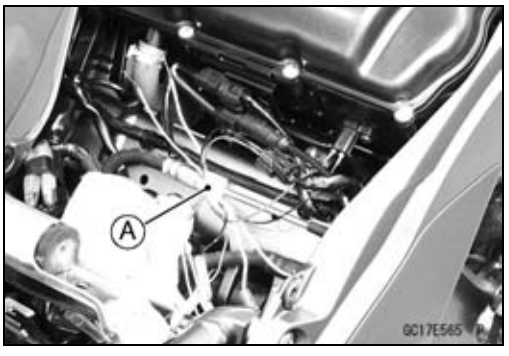
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the connector [A] from the intake air temperature sensor [B].
- Remove:
  Screw [C]
  Intake Air Temperature Sensor



- Be sure to install the O-ring [A].
- Install the intake air temperature sensor.
- Tighten:

Torque - Intake Air Temperature Sensor Mounting Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)

Intake Air Temperature Sensor Output Voltage Inspection

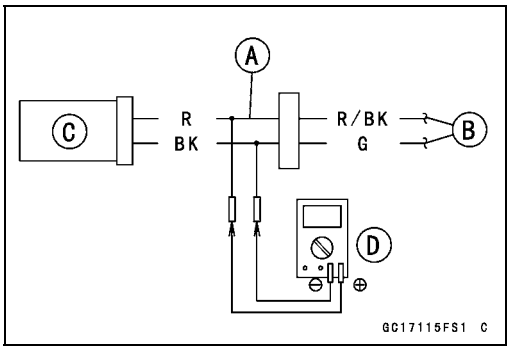


NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the intake air temperature sensor connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Intake Air Temperature Sensor [C]

Special Tool - Measuring Adapter: 57001-1700



- Connect a digital meter [D] to the measuring adapter leads.

Intake Air Temperature Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor R/BK) lead
Digital Meter (–) → BK (sensor G) lead

- Measure the output voltage with the engine stopped and the connector joined.
- Turn the ignition switch to ON.

Output Voltage
Standard: About DC 2.25 ~ 2.50 V at 20°C (68°F)

NOTE

○*The output voltage changes according to the intake air temperature.*

Intake Air Temperature Sensor (Service Code 13)

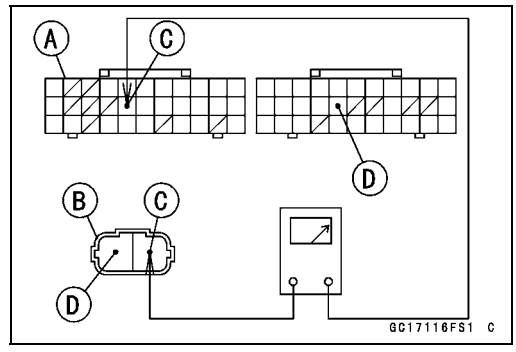
- Turn the ignition switch to OFF.

★If the reading is within the standard, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.



Wiring Inspection

ECU Connector [A] ←→

Intake Air Temperature Sensor Connector [B]

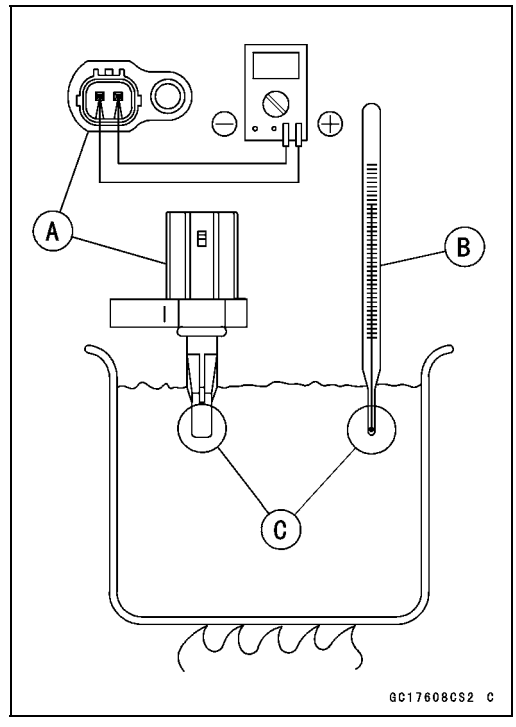
R/BK lead (ECU terminal 16) [C]

G lead (ECU terminal 49) [D]

★If the wiring is good, check the intake air temperature sensor resistance (see Intake Air Temperature Sensor Resistance Inspection).

Intake Air Temperature Sensor Resistance Inspection

- Remove the intake air temperature sensor (see Intake Air Temperature Sensor Removal/Installation).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion is submerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with the sensor.



NOTE

○*The sensor and thermometer must not touch the container side or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the following.

Intake Air Temperature Sensor Resistance

Standard: 5.4 ~ 6.6 kΩ at 0°C (32°F)

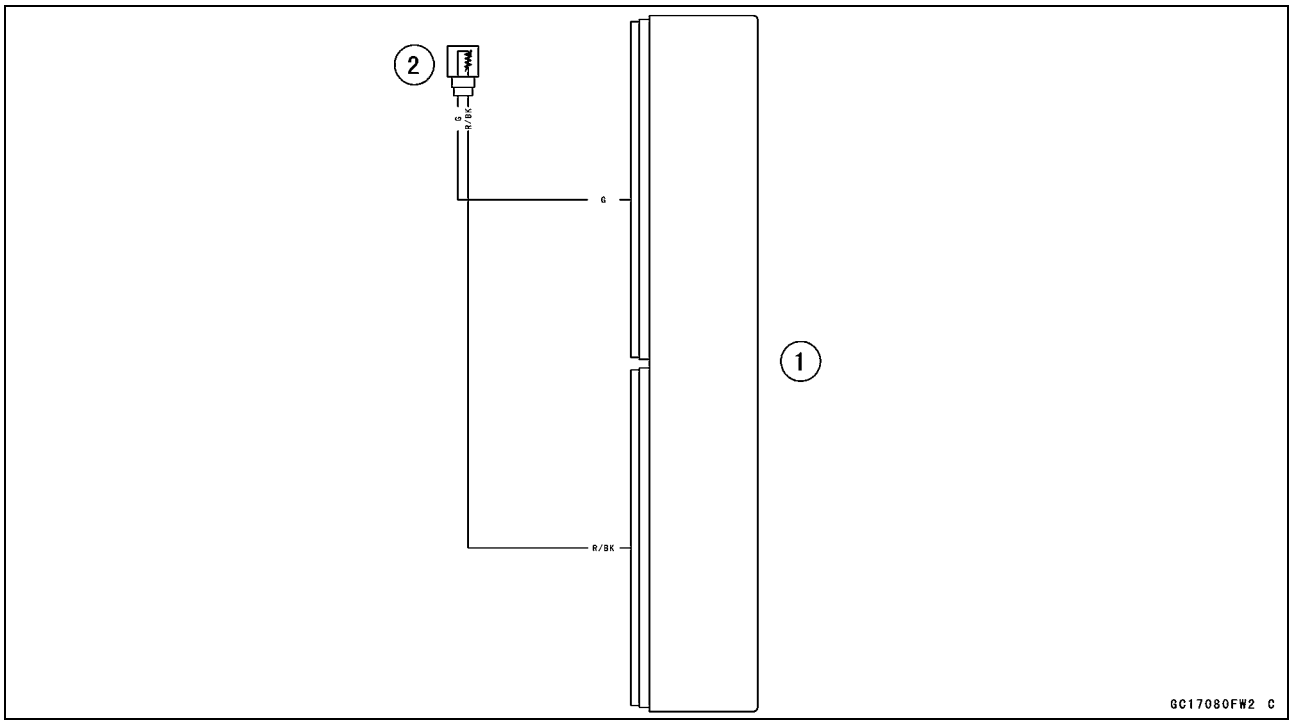
0.29 ~ 0.39 kΩ at 80°C (176°F)

★If the reading is out of the standard, replace the sensor.

★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

Intake Air Temperature Sensor (Service Code 13)

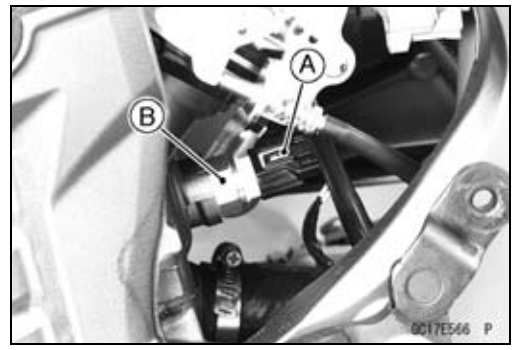
Intake Air Temperature Sensor Circuit



1. ECU
2. Intake Air Temperature Sensor

Water Temperature Sensor (Service Code 14)

Water Temperature Sensor Removal/Installation



NOTICE

Never drop the water temperature sensor especially on a hard surface. Such a shock to the sensor can damage it.

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Left Side Cover (see Side Cover Removal in the Frame chapter)
  Connector [A]
  Water Temperature Sensor [B]
- Replace the water temperature sensor gasket with a new one and apply soap and water solution or rubber lubricant to it.
- Tighten:

Torque - Water Temperature Sensor: 12 N·m (1.2 kgf·m, 106 in·lb)

- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).

Water Temperature Sensor Output Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

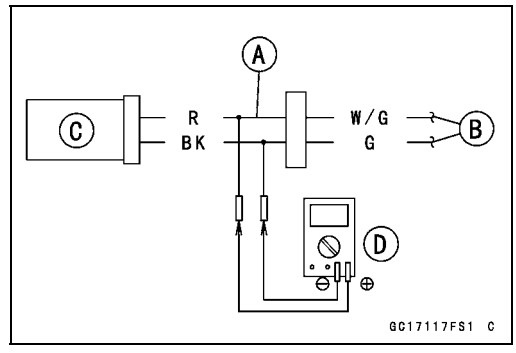
- Turn the ignition switch to OFF.

- Disconnect the water temperature sensor connector and connect the measuring adapter [A] between these connectors as shown in the figure.
  Harness [B]
  Water Temperature Sensor [C]

Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter [D] to the measuring adapter leads.

Water Temperature Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor W/G) lead
Digital Meter (–) → BK (sensor G) lead



- Measure the output voltage with the engine stopped and the connector joined.
- Turn the ignition switch to ON.

Output Voltage
Standard: About DC 2.80 ~ 2.97 V at 20°C (68°F)

NOTE

○*The output voltage changes according to the coolant temperature in the engine.*

Water Temperature Sensor (Service Code 14)

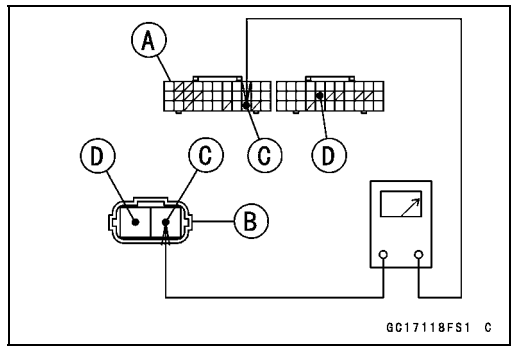
● Turn the ignition switch to OFF.
★If the reading is within the standard, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between harness connectors.

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Water Temperature Sensor Connector [B]
W/G lead (ECU terminal 30) [C]
G lead (ECU terminal 49) [D]

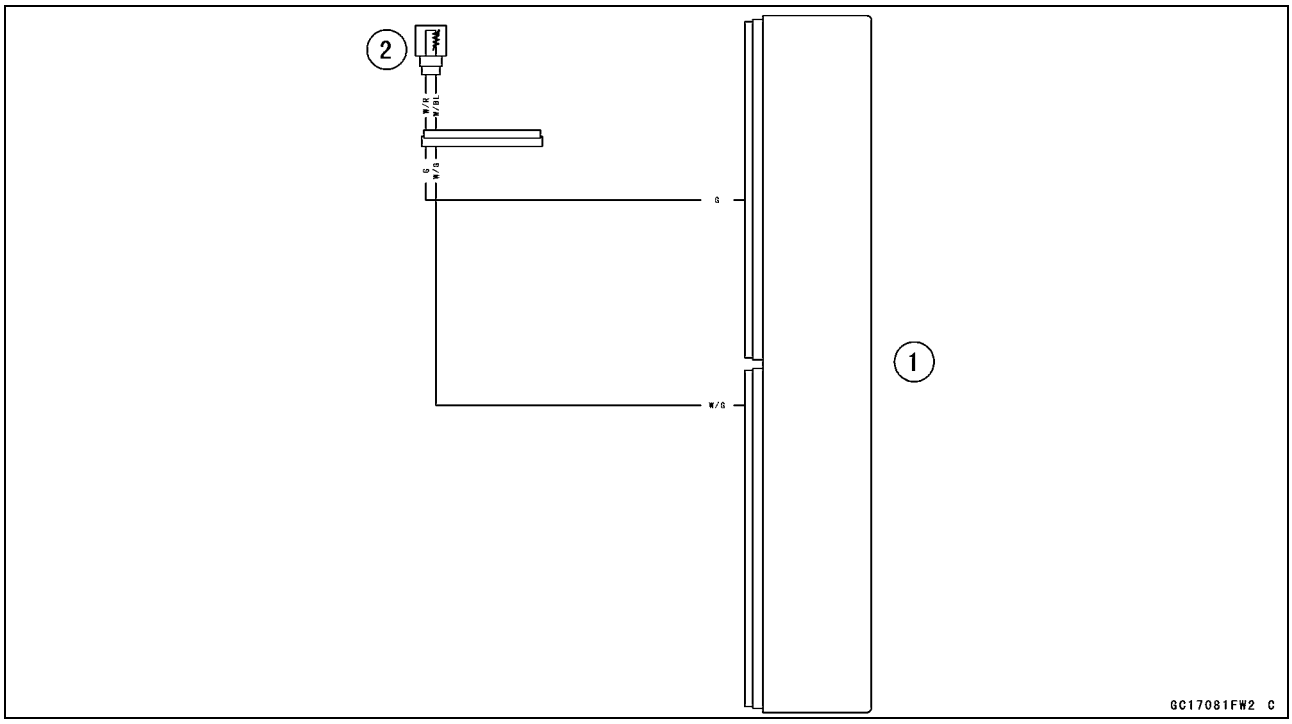


★If the wiring is good, check the water temperature sensor resistance (see Water Temperature Sensor Resistance Inspection).

Water Temperature Sensor Resistance Inspection

● Refer to the Water Temperature Sensor Inspection in the Electrical System chapter.
★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

Water Temperature Sensor Circuit



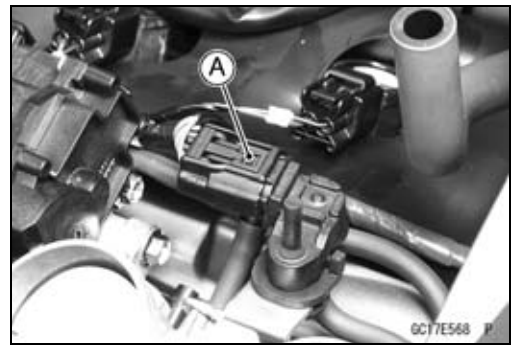
1. ECU
2. Water Temperature Sensor

Intake Air Pressure Sensor #2 (Service Code 16)

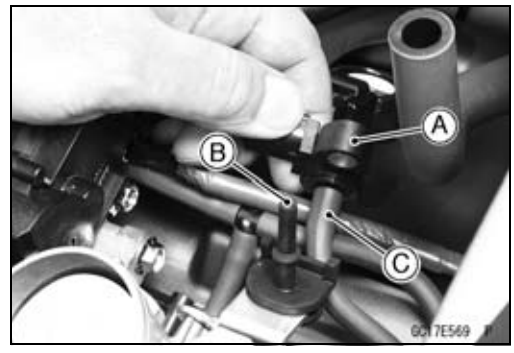
Intake Air Pressure Sensor #2 Removal

NOTICE

Never drop the intake air pressure sensor #2 especially on a hard surface. Such a shock to the sensor can damage it.



- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the sensor connector [A].

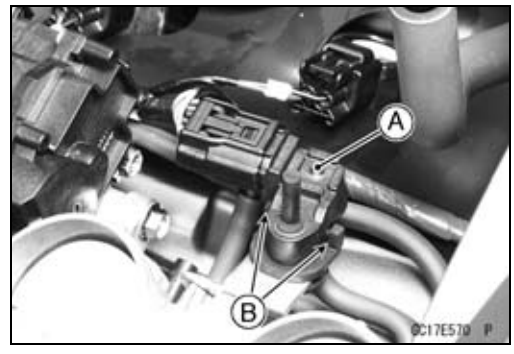


- Remove the intake air pressure sensor #2 [A] from the rubber damper [B] in the bracket and separate the vacuum hose [C].

Intake Air Pressure Sensor #2 Installation

NOTE

○*The intake air pressure sensor #2 is the same part as the intake air pressure sensor #1.*



- Installation is the reverse of removal.

○Position the intake air pressure sensor #2 [A] between the projection [B] on the rubber damper.

Intake Air Pressure Sensor #2 (Service Code 16)

Intake Air Pressure Sensor #2 Input Voltage Inspection

NOTE

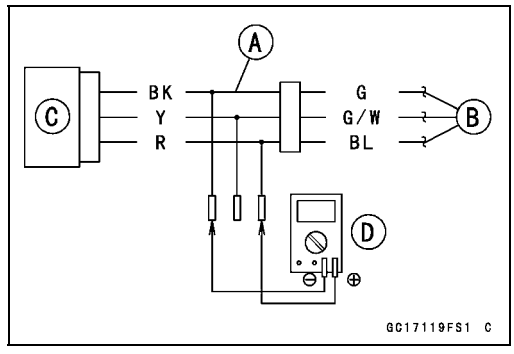
○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the intake air pressure sensor #2 connector and connect the measuring adapter [A] between these connectors.
  [B] Main Harness
  [C] Intake Air Pressure Sensor #2

Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter [D] to the measuring adapter leads.

Intake Air Pressure Sensor #2 Input Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead



- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Input Voltage
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch to OFF.

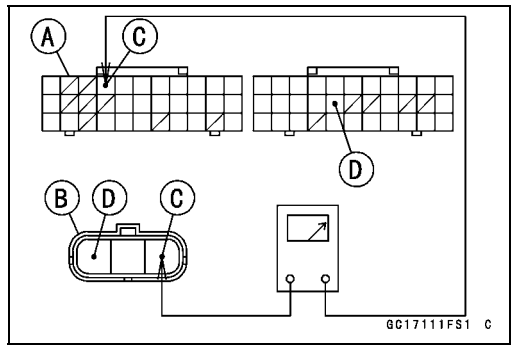
★If the reading is within the standard, check the output voltage (see Intake Air Pressure Sensor #2 Output Voltage Inspection).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Pressure Sensor #2 Connector [B]
BL lead (ECU terminal 4) [C]
G lead (ECU terminal 49) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Intake Air Pressure Sensor #2 (Service Code 16)

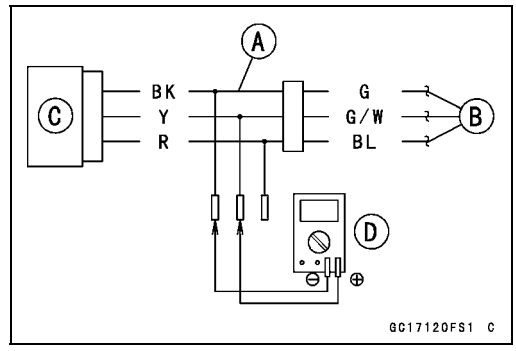
Intake Air Pressure Sensor #2 Output Voltage Inspection

● Measure the output voltage at the intake air pressure sensor #2 in the same way as input voltage inspection, note the following.

○Disconnect the intake air pressure sensor #2 connector and connect the measuring adapter [A] between these connectors.

[B] Main Harness
[C] Intake Air Pressure Sensor #2
[D] Digital Meter

Special Tool - Measuring Adapter: 57001-1700



Intake Air Pressure Sensor #2 Output Voltage
Connections to Adapter:
Digital Meter (+) → Y (sensor G/W) lead
Digital Meter (–) → BK (sensor G) lead

● Measure the output voltage with the engine stopped and with the connector joined.

● Turn the ignition switch to ON.

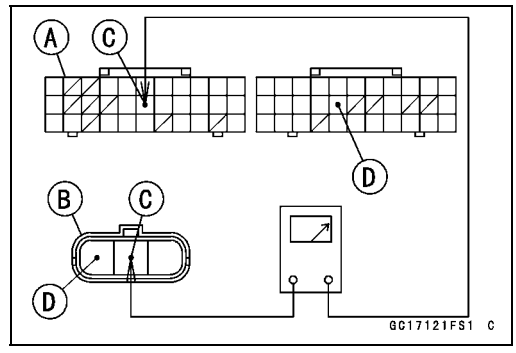
Output Voltage
Usable Range: DC 3.80 ~ 4.20 V at standard atmospheric pressure (101.32 kPa, 76 cmHg absolute)

NOTE

○*The output voltage changes according to the local atmospheric pressure.*

● Turn the ignition switch to OFF.

★If the reading is out of the usable range, replace the sensor.



★If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness connector.

Special Tool - Hand Tester: 57001-1394

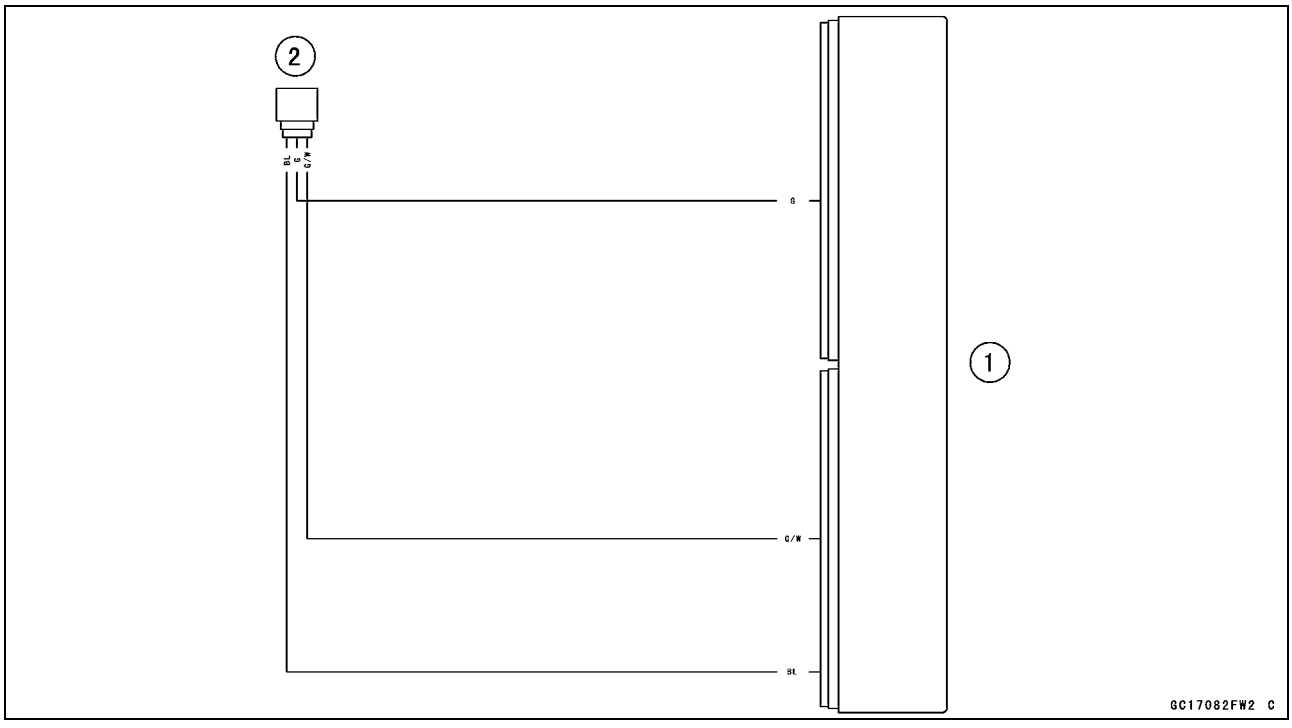
○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Pressure Sensor #2 Connector [B]
G/W lead (ECU terminal 17) [C]
G lead (ECU terminal 49) [D]

★If the wiring is good, check the sensor for various vacuum (see Intake Air Pressure Sensor #1 Output Voltage Inspection).

Intake Air Pressure Sensor #2 (Service Code 16)

Intake Air Pressure Sensor #2 Circuit



1. ECU
2. Intake Air Pressure Sensor #2

Crankshaft Sensor (Service Code 21)

The crankshaft sensor has no power source, and when the engine stops, the crankshaft sensor generates no signals.

Crankshaft Sensor Removal/Installation

● Refer to the Crankshaft Sensor Removal/Installation in the Electrical System chapter.

Crankshaft Sensor Resistance Inspection

● Refer to the Crankshaft Sensor Inspection in the Electrical System chapter.

★If the reading is within the standard, check the peak voltage (see Crankshaft Sensor Peak Voltage Inspection).

Crankshaft Sensor Peak Voltage Inspection

● Refer to the Crankshaft Sensor Peak Voltage Inspection in the Electrical System chapter.

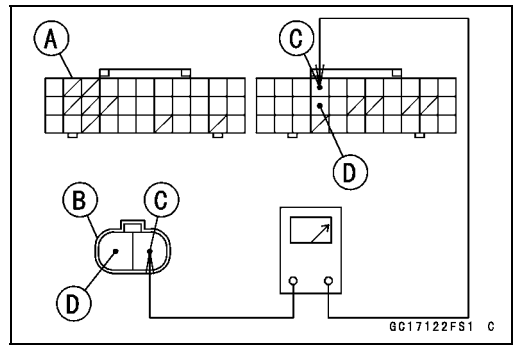
★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

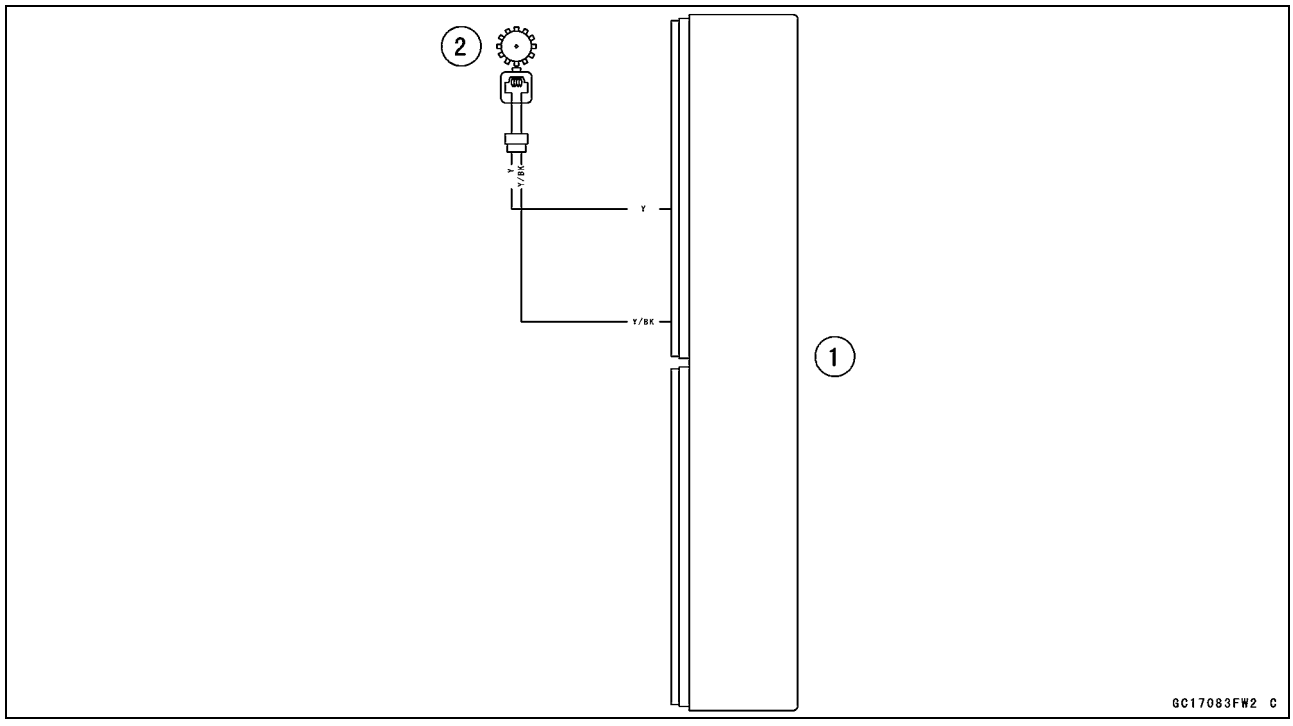
Wiring Inspection
ECU Connector [A] ←→
Crankshaft Sensor Connector [B]
Y/BK lead (ECU terminal 37) [C]
Y lead (ECU terminal 48) [D]

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



Crankshaft Sensor Circuit



1. ECU
2. Crankshaft Sensor

Rear Wheel Rotation Sensor Signal (Service Code 24)

Rear Wheel Rotation Sensor Signal Inspection

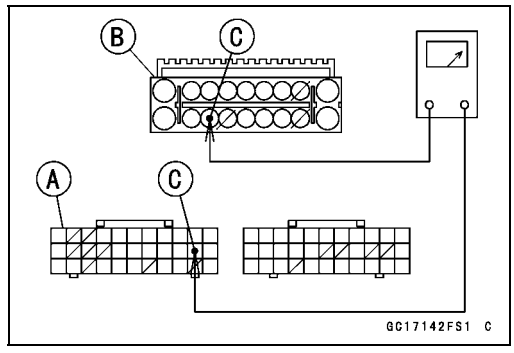
○The rear wheel rotation sensor sends the signal to the ECU through the ABS hydraulic unit.
○The ECU uses the rear wheel rotation sensor signal for motorcycle speed and KTRC control.
○The service code 24 is detected with the ECU.
● When the service code 24 and following service codes (for ABS) are displayed at the same time, inspect the rear wheel rotation sensor.
Service Code 44 (see Rear Wheel Rotation Sensor Signal Abnormal in the Brakes chapter)
Service Code 45 (see Rear Wheel Rotation Sensor Wiring Inspection in the Brakes chapter)

● When only service code 24 is displayed, do the following inspection procedures.
● Disconnect:
ECU Connectors (see ECU Removal)
Rear Wheel Rotation Sensor Lead Connector (see Rear Wheel Rotation Sensor Removal in the Brakes chapter)
ABS Hydraulic Unit Connector (see ABS Hydraulic Unit Removal in the Brakes chapter)

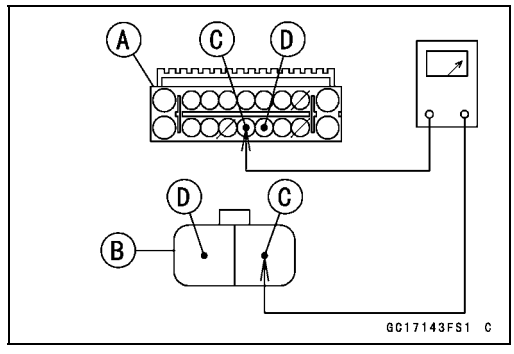
● Check the wiring for continuity between harness connectors.

Special Tool - Hand Tester: 57001-1394

Wiring Continuity Inspection
ECU Connector [A] ← →
ABS Hydraulic Unit Connector [B]
R/Y lead (ECU terminal 21, ABS Hydraulic Unit terminal 16) [C]



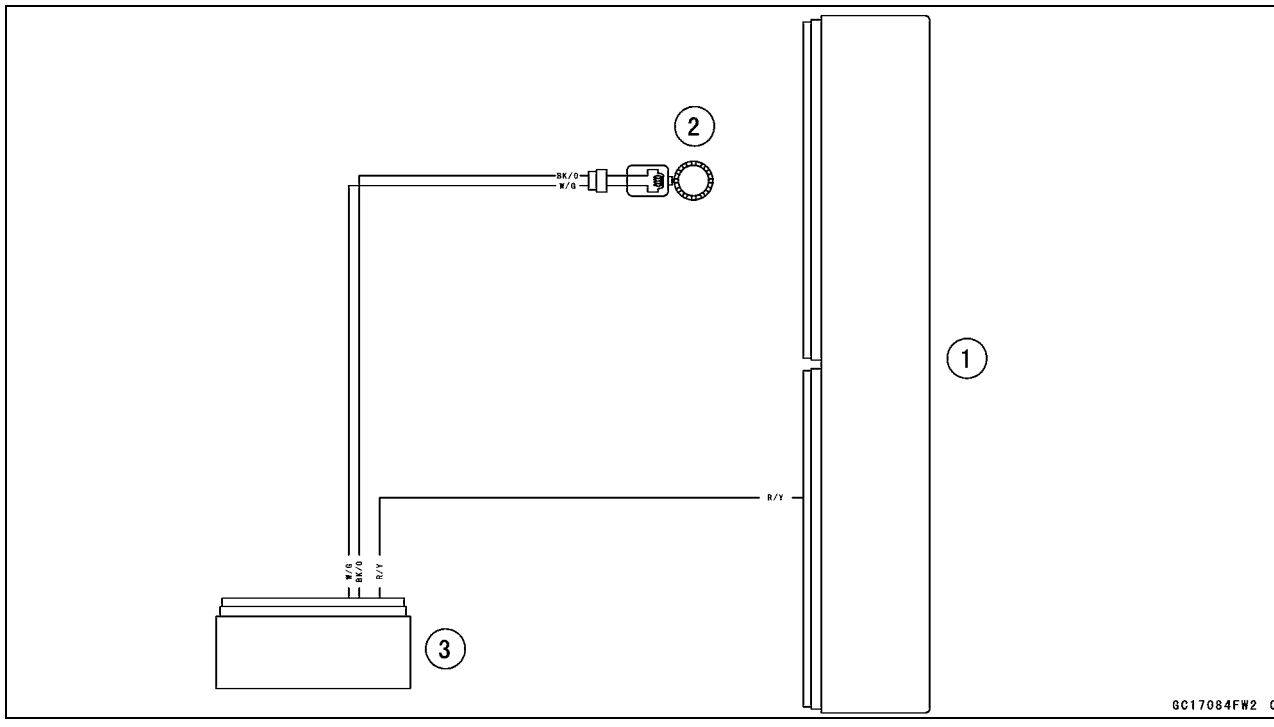
Wiring Continuity Inspection
ABS Hydraulic Unit Connector [A] ← →
Rear Wheel Rotation Sensor Connector [B]
BK/O lead (ABS Hydraulic Unit Connector terminal 14) [C]
W/G lead (ABS Hydraulic Unit Connector terminal 13) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Rear Wheel Rotation Sensor Signal (Service Code 24)

Rear Wheel Rotation Sensor Circuit



1. ECU
2. Rear Wheel Rotation Sensor
3. ABS Hydraulic Unit

Front Wheel Rotation Sensor Signal (Service Code 27)

Front Wheel Rotation Sensor Signal Inspection

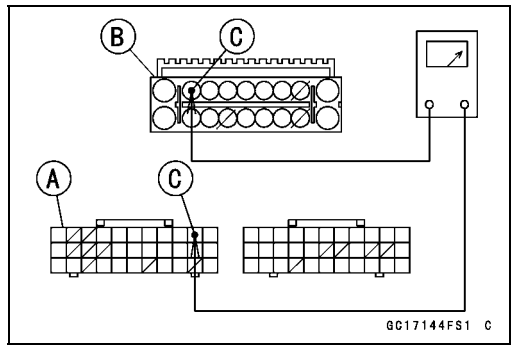
○The front wheel rotation sensor sends the signal to the ECU through the ABS hydraulic unit.
○The ECU uses the wheel rotation sensor signal for KTRC control.
○The service code 27 is detected with the ECU.
● When the service code 27 and following service codes (for ABS) are displayed at the same time, inspect the front wheel rotation sensor.
Service Code 42 (see Front Wheel Rotation Sensor Signal Abnormal in the Brakes chapter)
Service Code 43 (see Front Wheel Rotation Sensor Wiring Inspection in the Brakes chapter)

● When only service code 27 is displayed, do the following inspection procedures.
● Disconnect:
ECU Connectors (see ECU Removal in the Fuel System (DFI) chapter)
Front Wheel Rotation Sensor Lead Connector (see Front Wheel Rotation Sensor Removal in the Brakes chapter)
ABS Hydraulic Unit Connector (see ABS Hydraulic Unit Removal in the Brakes chapter)

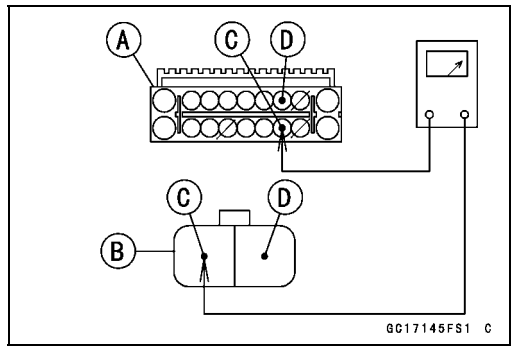
● Check the wiring for continuity between harness connectors.

Special Tool - Hand Tester: 57001-1394

Wiring Continuity Inspection
ECU Connector [A] ← →
ABS Hydraulic Unit Connector [B]
G/Y lead (ECU terminal 10, ABS Hydraulic Unit terminal 8) [C]



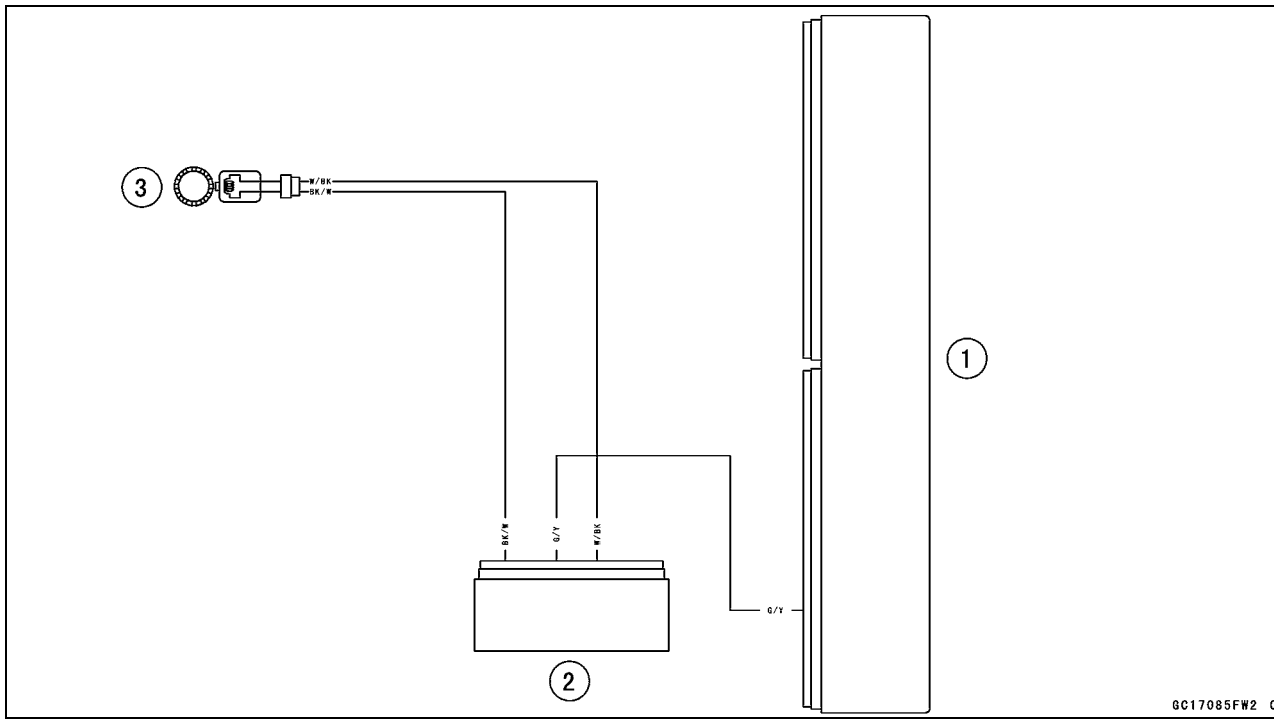
Wiring Continuity Inspection
ABS Hydraulic Unit Connector [A] ← →
Front Wheel Rotation Sensor Connector [B]
W/BK lead (ABS Hydraulic Unit Connector terminal 12) [C]
BK/W lead (ABS Hydraulic Unit Connector terminal 3) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Front Wheel Rotation Sensor Signal (Service Code 27)

Front Wheel Rotation Sensor Circuit



1. ECU
2. ABS Hydraulic Unit
3. Front Wheel Rotation Sensor

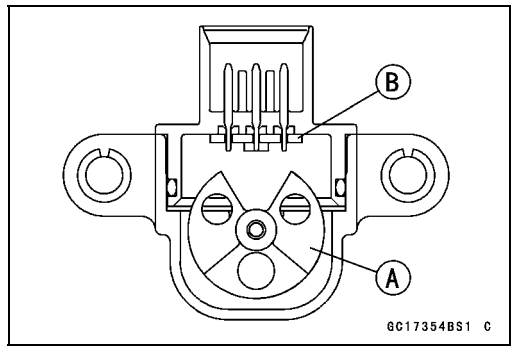
Vehicle-down Sensor (Service Code 31)

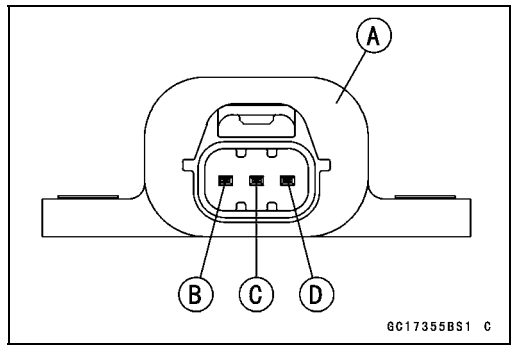
This sensor has a weight [A] with two magnets inside, and sends a signal to the ECU. But when the motorcycle banks 60 ~ 70° or more to either side (in fact falls down), the weight turns and the signal changes. The ECU senses this change, and stops the fuel pump relay, the fuel injectors and the ignition system.

Hall IC [B]

When the motorcycle is down, the ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON.

Vehicle-down Sensor [A]
Ground Terminal G [B]
Output Terminal Y/G [C]
Power Source Terminal BL [D]



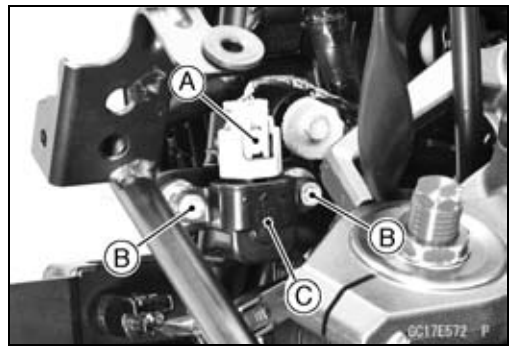


Vehicle-down Sensor Removal

NOTICE

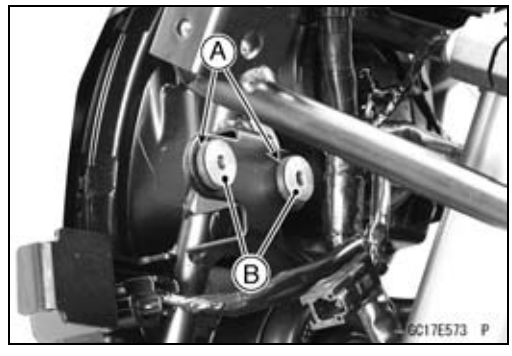
Never drop the vehicle-down sensor especially on a hard surface. Such a shock to the sensor can damage it.

- Remove:
  Left Upper Side Fairing (see Upper Side Fairing Removal in the Frame chapter)
  Connector [A]
  Bolts [B] and Nuts
  Vehicle-down Sensor [C]



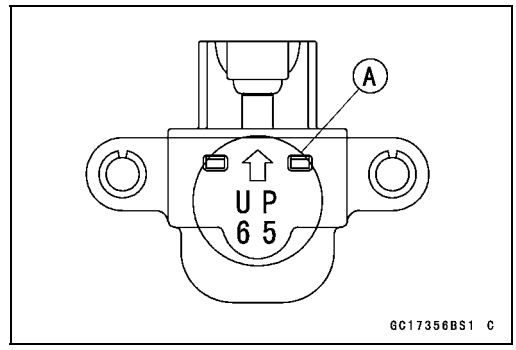
Vehicle-down Sensor Installation

- Be sure to install the rubber dampers [A] and collars [B] on the upper fairing bracket.



Vehicle-down Sensor (Service Code 31)

● The UP mark [A] of the sensor should face upward.



⚠ WARNING

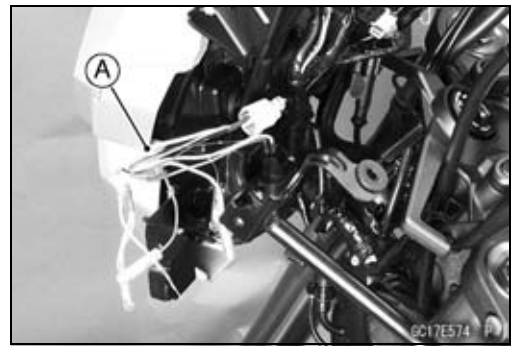
Incorrect installation of the vehicle-down sensor could cause sudden loss of engine power. The rider could lose balance during certain riding situations for an accident resulting in injury or death. Ensure that the vehicle-down sensor is held in place on the upper fairing bracket.

Vehicle-down Sensor Input Voltage Inspection

NOTE

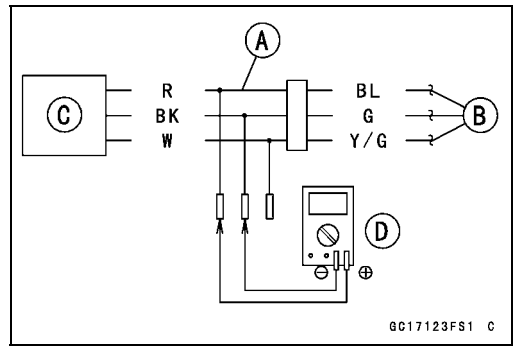
○*Be sure the battery is fully charged.*

● Turn the ignition switch to OFF.
● Disconnect the vehicle-down sensor connector and connect the measuring adapter [A] between these connectors as shown.
Main Harness [B]
Vehicle-down Sensor [C]



Special Tool - Measuring Adapter: 57001-1700

● Connect a digital meter [D] to the measuring adapter leads.



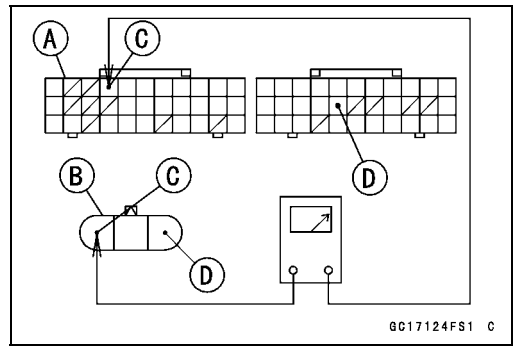
Vehicle-down Sensor Input Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead

● Measure the input voltage with the engine stopped and with the connector joined.
● Turn the ignition switch to ON.

Input Voltage
Standard: DC 4.75 ~ 5.25 V

● Turn the ignition switch to OFF.
★If the reading is within the standard, check the output voltage (see Vehicle-down Sensor Output Voltage Inspection).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.
○Disconnect the ECU and sensor connections.

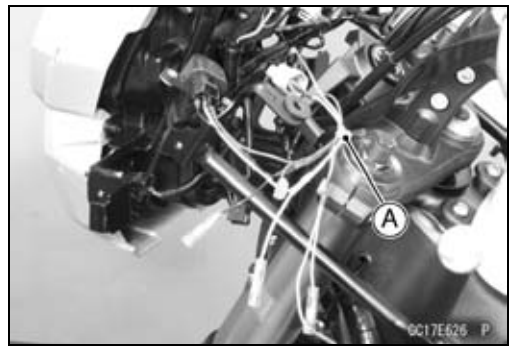


Wiring Inspection
ECU Connector [A] ←→
Vehicle-down Sensor Connector [B]
BL lead (ECU terminal 4) [C]
G lead (ECU terminal 49) [D]

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Vehicle-down Sensor (Service Code 31)

Vehicle-down Sensor Output Voltage Inspection



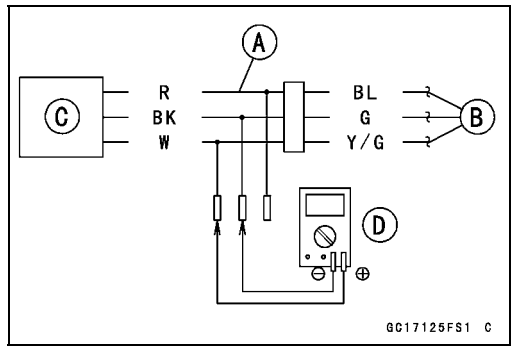
- Remove the vehicle-down sensor (see Vehicle-down Sensor Removal).
- Connect the measuring adapter [A] to the vehicle-down sensor connectors as shown.

Special Tool - Measuring Adapter: 57001-1700

Main Harness [B]
Vehicle-down Sensor [C]

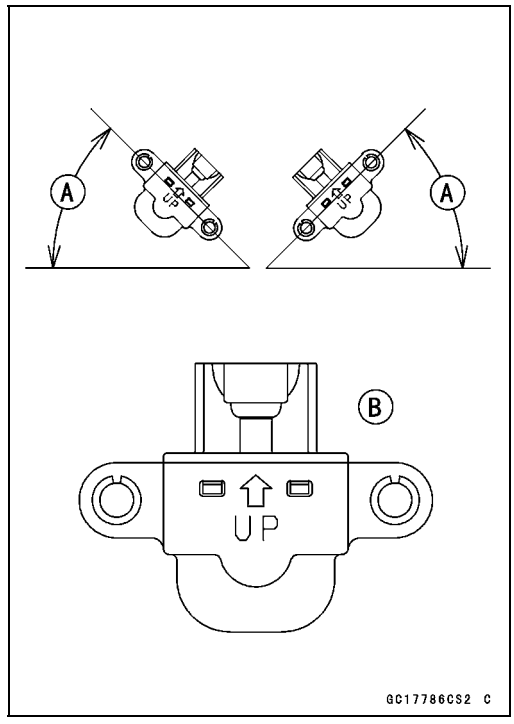
- Connect a digital meter [D] to the measuring adapter leads.

Vehicle-down Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → W (sensor Y/G) lead
Digital Meter (–) → BK (sensor G) lead



- Hold the sensor vertically.
- Measure the output voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.
- Tilt the sensor 60 ~ 70° or more [A] right or left, then hold the sensor almost vertical with the arrow mark pointed up [B], and measure the output voltage.

Output Voltage
Standard: With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V
With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V



NOTE

○*If you need to test again, turn the ignition switch OFF, and then ON.*

- Turn the ignition switch to OFF.

★If the reading is out of the standard, replace the sensor.

Vehicle-down Sensor (Service Code 31)

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

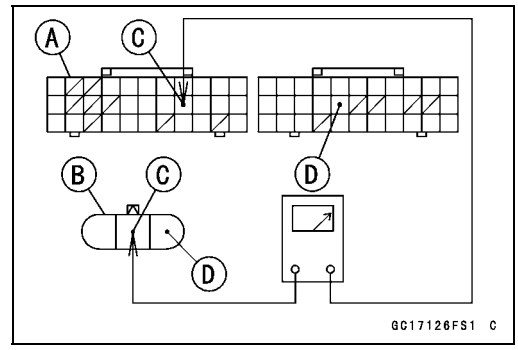
Wiring Inspection

ECU Connector [A] ←→

Vehicle-down Sensor Connector [B]

Y/G lead (ECU terminal 19) [C]

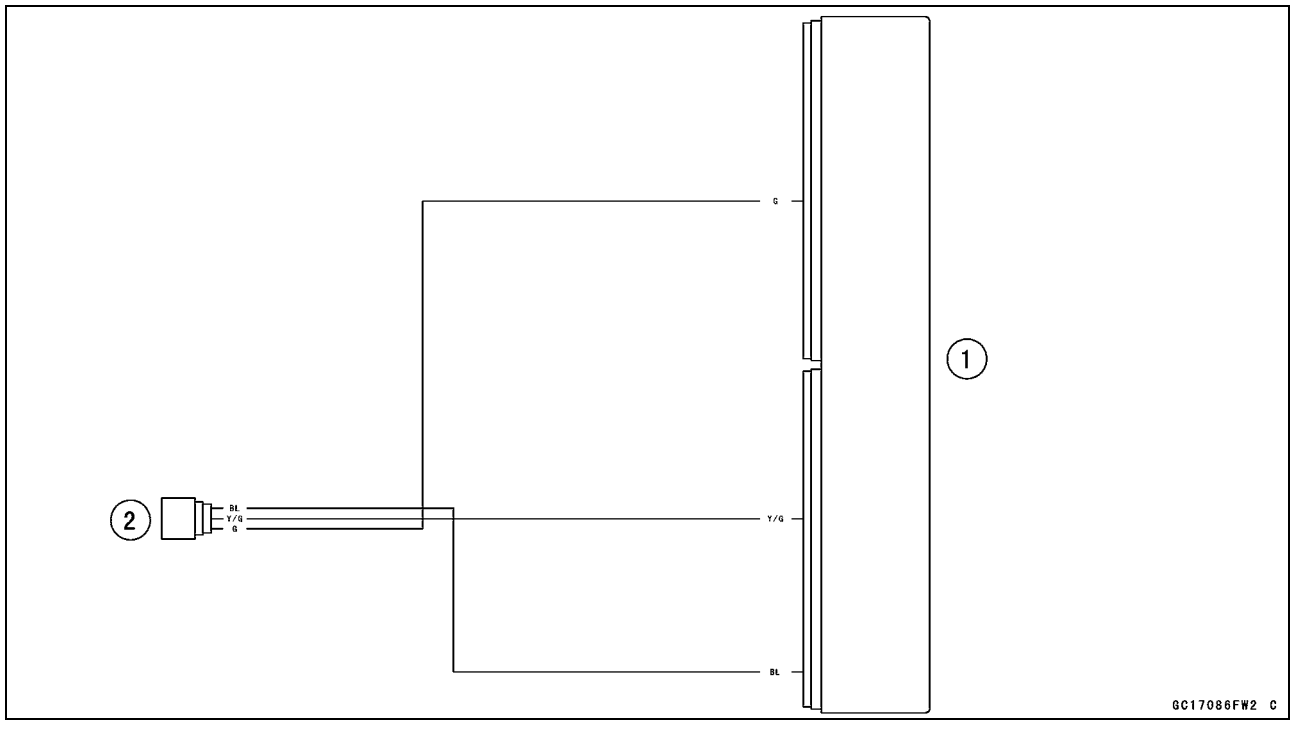
G lead (ECU terminal 49) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Vehicle-down Sensor Circuit

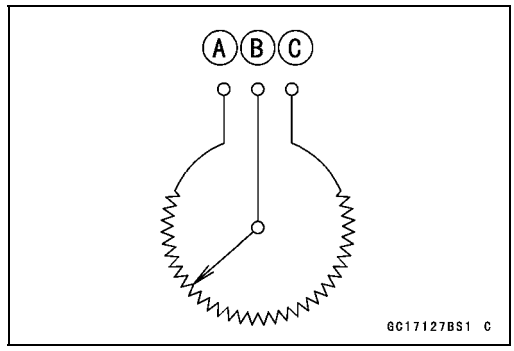


1. ECU
2. Vehicle-down Sensor

Subthrottle Sensor (Service Code 32)

The subthrottle sensor is a rotating variable resistor that change output voltage according to throttle operating. The ECU senses this voltage change and determines fuel injection quantity, and ignition timing according to engine rpm, and throttle opening.

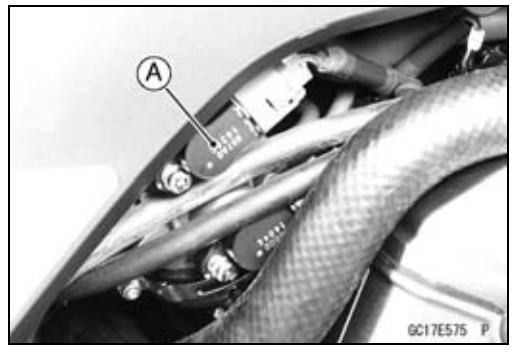
Input Terminal [A]
Output Terminal [B]
Ground Terminal [C]



Subthrottle Sensor Removal/Adjustment

NOTICE

Do not remove or adjust the subthrottle sensor [A] since it has been adjusted and set with precision at the factory.
Never drop the throttle body assy especially on a hard surface. Such a shock to the subthrottle sensor can damage it.



Subthrottle Sensor Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the subthrottle sensor and connect the throttle sensor setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

- Connect a digital meter to the throttle sensor setting adapter leads.

Subthrottle Sensor Input Voltage
Connections to Adapter:
Digital Meter (+) → W (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Input Voltage
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch to OFF.

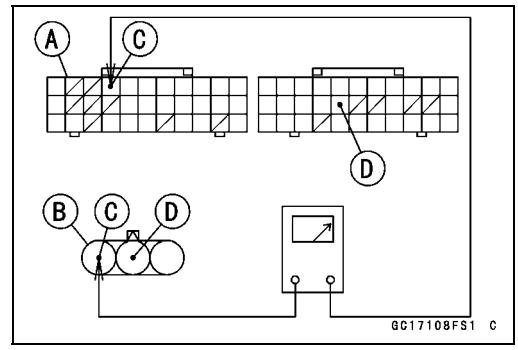
★If the reading is within the standard, check the output voltage (see Subthrottle Sensor Output Voltage Inspection).

Subthrottle Sensor (Service Code 32)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

Wiring Inspection
ECU Connector [A] ←→
Subthrottle Sensor Connector [B]
BL lead (ECU terminal 4) [C]
G lead (ECU terminal 49) [D]



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Subthrottle Sensor Output Voltage Inspection

● Measure the output voltage at the subthrottle sensor in the same way as input voltage inspection, note the following.

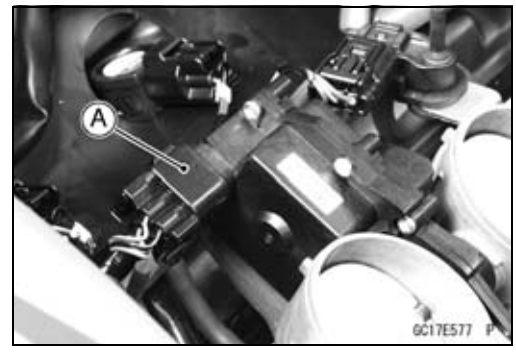
○Disconnect the subthrottle sensor connector and connect the throttle sensor setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

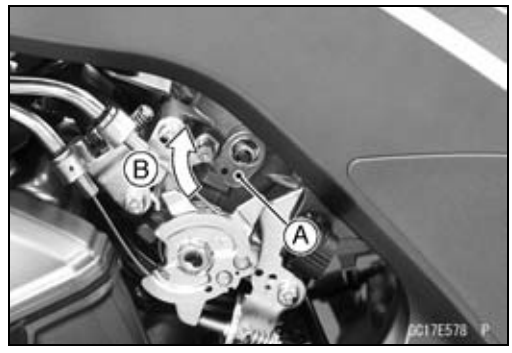
Subthrottle Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor BL/W) lead
Digital Meter (–) → BK (sensor G) lead

● Remove the air cleaner housing (see Air Cleaner Housing Removal).

● Disconnect the subthrottle valve actuator harness connector [A].



Subthrottle Sensor (Service Code 32)



- Measure the output voltage with the engine stopped with the connector joined.
- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Turn the ignition switch to ON.
- Measure the output voltage when the subthrottle valve is completely closed by turning the lever [A] fully clockwise [B].

Output Voltage

Standard: DC 1.08 ~ 1.12 V at subthrottle valve full close position

DC 4.2 ~ 4.4 V at subthrottle valve full open position (for reference)

NOTE

○*Turn the lever counterclockwise, confirm the output voltage will be raise.*

○*The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*

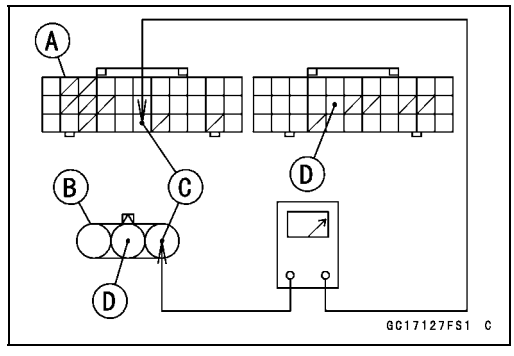
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
Example:
In the case of a input voltage of 4.75 V.
1.08 × 4.75 ÷ 5.00 = 1.03 V
1.12 × 4.75 ÷ 5.00 = 1.06 V
Thus, the valid range is 1.03 ~ 1.06 V

- Turn the ignition switch to OFF.

★If the reading is out of the standard, check the subthrottle sensor resistance (see Subthrottle Sensor Resistance Inspection).

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.



Wiring Inspection

ECU Connector [A] ←→

Subthrottle Sensor Connector [B]

BL/W lead (ECU terminal 28) [C]

G lead (ECU terminal 49) [D]

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Subthrottle Sensor (Service Code 32)

Subthrottle Sensor Resistance Inspection

- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the subthrottle sensor connector.

○Disconnect the subthrottle sensor connector and connect the throttle sensor setting adapter [A] to the sensor connector only.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

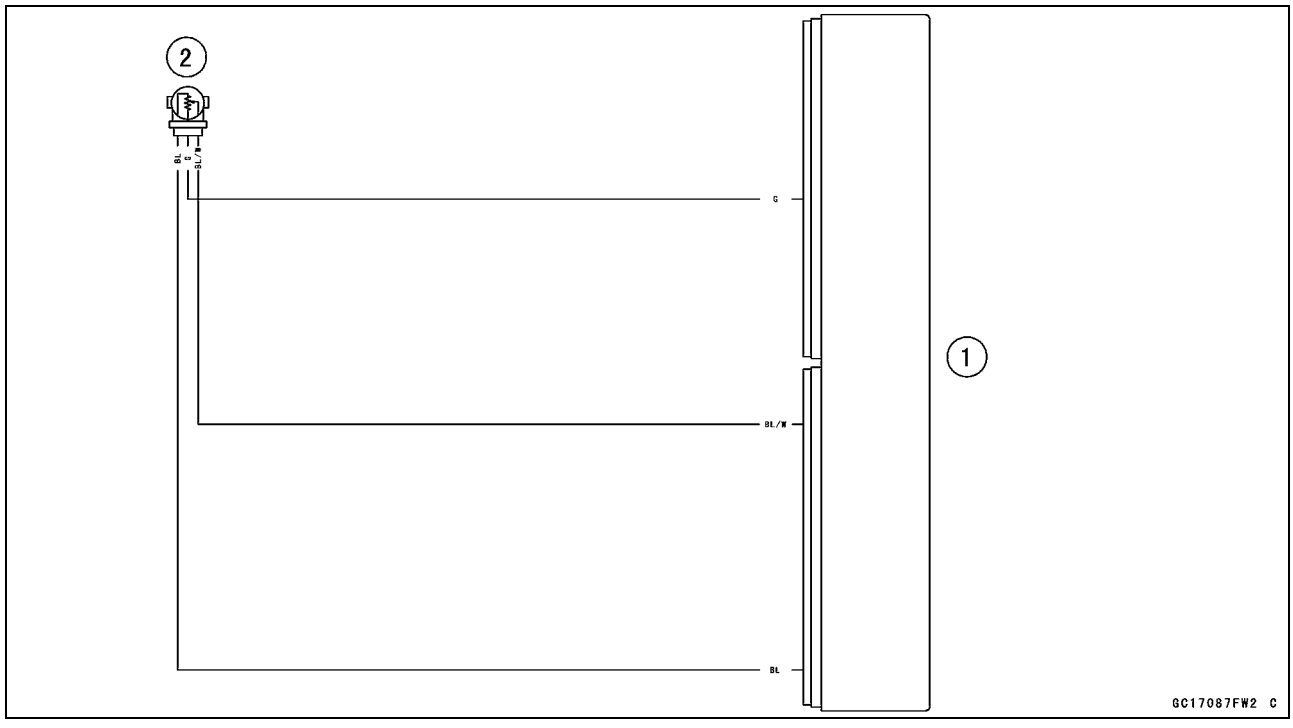
Subthrottle Sensor Output Resistance
Connections to Adapter:
Digital Meter (+) → W (sensor BL) lead
Digital Meter (–) → BK (sensor G) lead

Standard: 4 ~ 6 kΩ

★If the reading is out of the standard, replace the throttle body assy.

★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

Subthrottle Sensor Circuit



1. ECU
2. Subthrottle Sensor

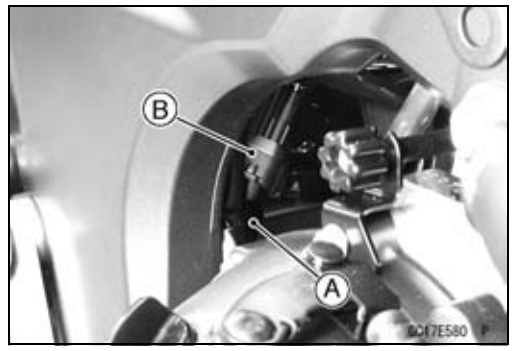
Oxygen Sensor - not activated (Service Code 33)

Oxygen Sensor Removal/Installation

- Refer to the Oxygen Sensor Removal/Installation in the Electrical System chapter.

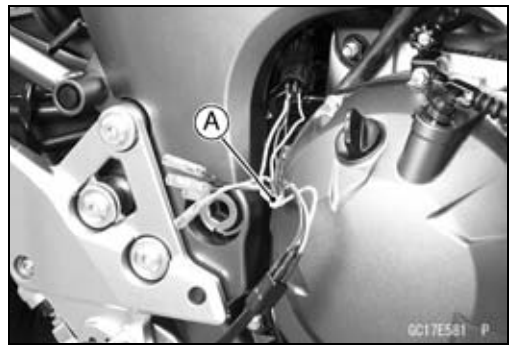
Oxygen Sensor Inspection

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Open the clamp [A], and pull out the oxygen sensor lead connector [B].



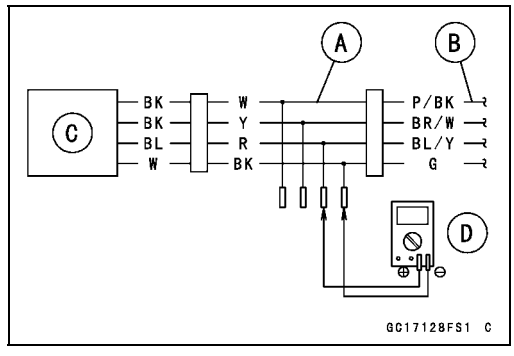
- Disconnect the oxygen sensor lead connector (4 pins connector) and connect the measuring adapter [A] between these connectors.
  [B] Main Harness
  [C] Oxygen Sensor

  Special Tool - Measuring Adapter: 57001-1700



- Connect a digital meter [D] to the measuring adapter leads.

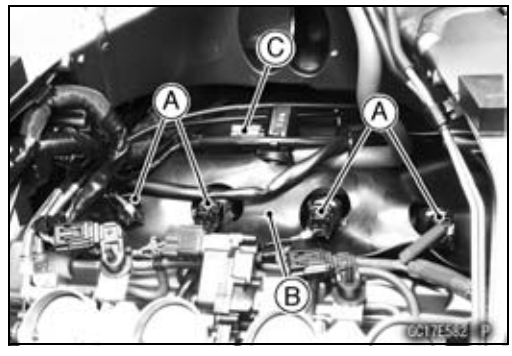
  Oxygen Sensor Output Voltage
  Connections to Adapter:
  Digital Meter (+) → R (sensor BL/Y) lead
  Digital Meter (−) → BK (sensor G) lead



- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal)

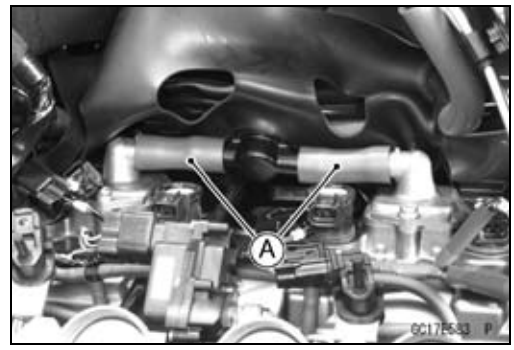
- Disconnect the stick coil connectors [A].
- Pull up the rubber cover [B] forward.

○Do not disconnect the air switching valve connector [C].

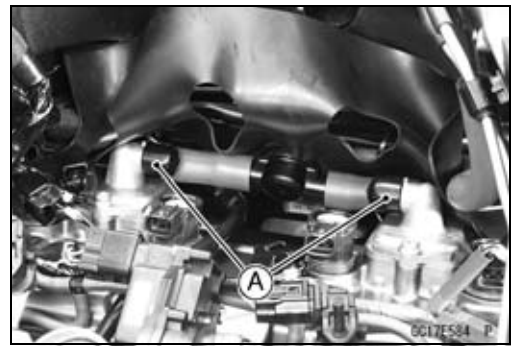


Oxygen Sensor - not activated (Service Code 33)

- Separate the air switching valve hoses [A] from the air suction valve covers.

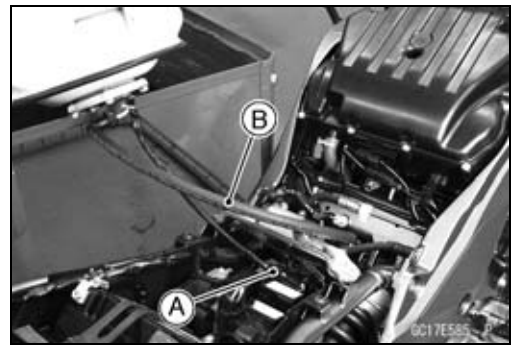


- Install the suitable plugs [A] on the fitting of the air suction valve covers, and shut off the secondary air.
- Reposition the rubber cover and connect the stick coil connectors.
- Install the air cleaner housing temporarily (see Air Cleaner Housing Installation).



- Remove the fuel hose (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Connect the following parts temporary.
  Fuel Pump Lead Connector [A]
  Fuel Hose [B]

  Special Tool - Fuel Hose: 57001-1607

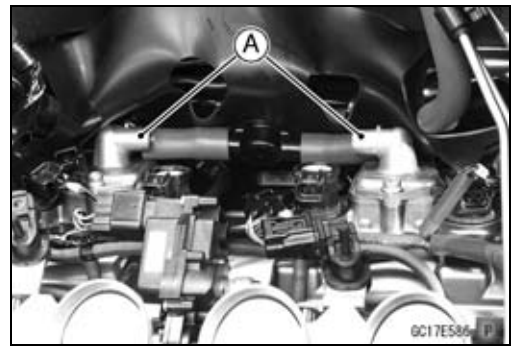


- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

  Output Voltage (with Plugs)
  Standard: DC 0.7 V or more

- Next, remove the air cleaner housing and pull up the rubber cover to take out the plugs from the fittings [A] of the air suction valve covers.
- Reposition the rubber cover and install the air cleaner housing.
- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

  Output Voltage (without Plugs)
  Standard: DC 0.2 V or less



- Turn the ignition switch to OFF.

Oxygen Sensor - not activated (Service Code 33)

★If the reading is out of the standard (with plugs: DC 0.7 V or more, without plugs: DC 0.2 V or less), remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

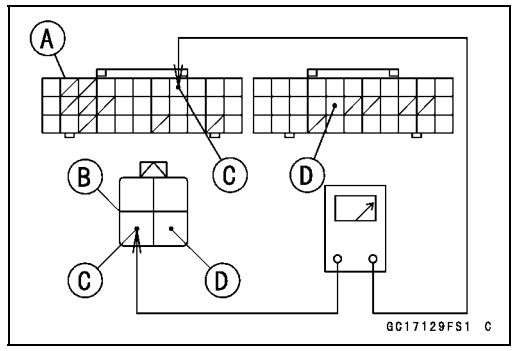
Wiring Inspection

ECU Connectors [A] ←→

Oxygen Sensor Connector [B]

BL/Y lead (ECU terminal 8) [C]

G lead (ECU terminal 49) [D]

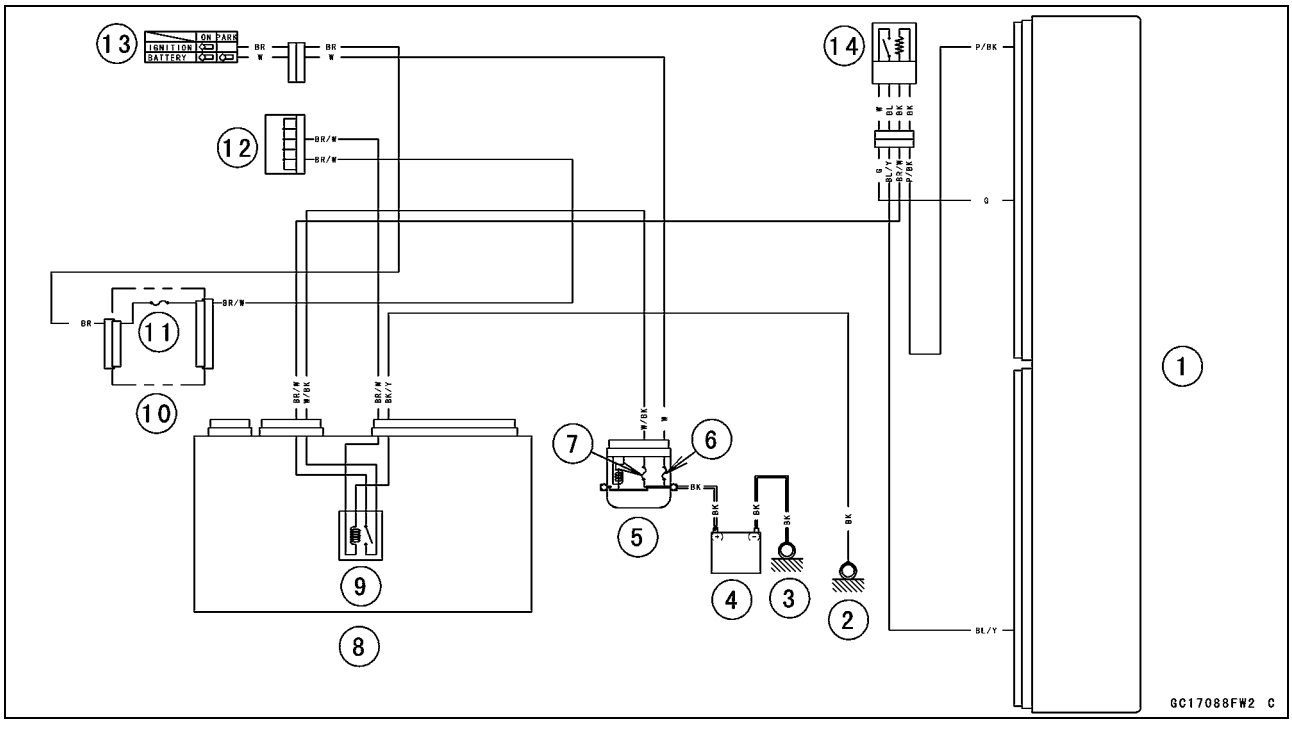


★If the wiring is good, replace the sensor.

★If the reading is within the standard (with plugs: DC 0.7 V or more, without plugs: DC 0.2 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Oxygen Sensor Circuit

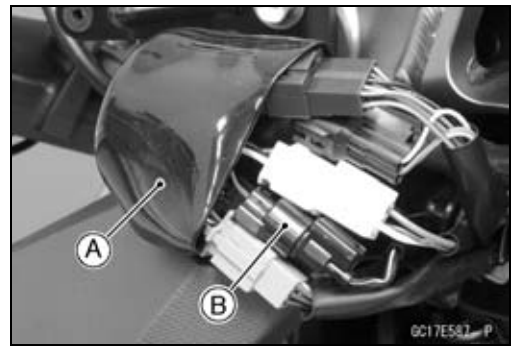


1. ECU
2. Frame Ground 3
3. Engine Ground
4. Battery 12 V 8 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Relay Box
9. ECU Main Relay
10. Fuse Box 1
11. Ignition Fuse 15 A
12. Joint Connector F
13. Ignition Switch
14. Oxygen Sensor

Immobilizer Amplifier (Service Code 35, Equipped Model)

Antenna Resistance Inspection

- Turn the ignition switch to OFF.
- Remove the left upper side fairing (see Upper Side Fairing Removal in the Frame chapter).
- Slide the rubber cover [A] and disconnect the antenna lead connector [B].
- Measure the antenna resistance.



Antenna Resistance
Connections: BK lead ←→ BK/W lead
Standard: About 3.0 ~ 4.6 Ω

★If the reading is out of the standard, replace the antenna (see Immobilizer System Parts Replacement in the Electrical System chapter).
★If the reading is within the standard, check the wiring to the amplifier (see Immobilizer System Circuit).
★If the wiring is good, check the input voltage of the amplifier (see Amplifier Input Voltage Inspection).

Amplifier Input Voltage Inspection

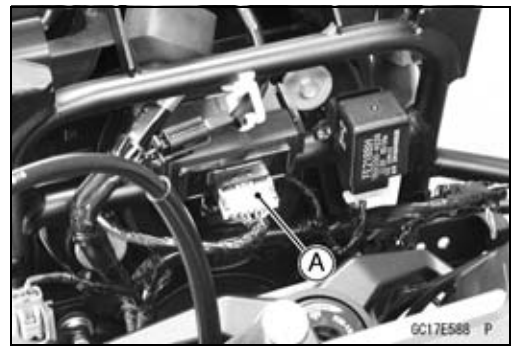
NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the meter cover (see Meter Cover Removal in the Frame chapter).

○Do not disconnect the connectors.

- Connect a digital meter to the amplifier connector [A] with needle adapter set.



Special Tool - Needle Adapter Set: 57001-1457

Amplifier Input Voltage
Connections to Amplifier Connector:
Digital Meter (+) → BR/W lead
Digital Meter (–) → BK/Y lead

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Input Voltage
Standard: Battery Voltage

- Turn the ignition switch to OFF.

★If the reading is out of the standard, check the wiring (see Immobilizer System Circuit).
★If the reading is within the standard, check the wiring to ECU (see ECU Power Source Circuit).
★If the wiring is good, replace the amplifier (see Immobilizer System Parts Replacement in the Electrical System chapter).

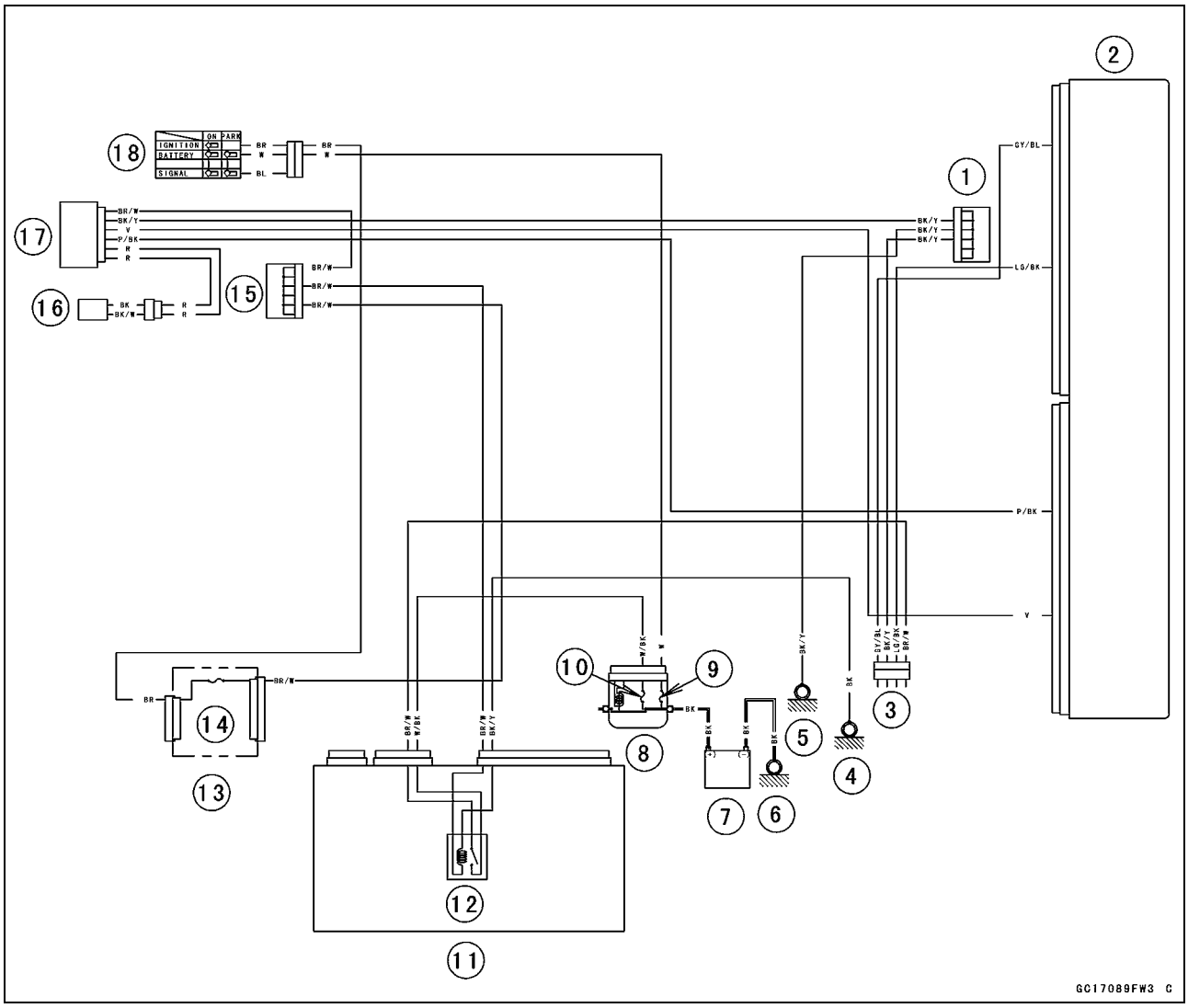
Blank Key Detection (Service Code 36, Equipped Model)

- This code appears in the following conditions.
○The transponder [A] in the ignition key is malfunction.
○When the spare ignition key of unregistration is used.
○When the ignition key is registered in the registered ECU.
- Therefore, the service code 36 will disappear when the above issue is solved.

Ignition Key Inspection

- Register the ignition key correctly (see Key Registration in the Electrical System chapter).
★If the service code 36 appears again, the transponder in the key is malfunction, replace it.

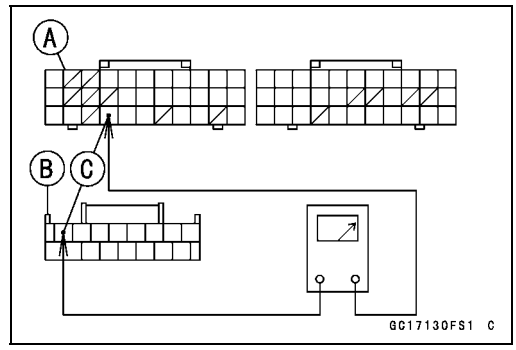
Immobilizer System Circuit



1. Joint Connector E
2. ECU
3. Immobilizer/Kawasaki Diagnostic System Connector
4. Frame Ground 3
5. Frame Ground 1
6. Engine Ground
7. Battery 12 V 8 Ah
8. Starter Relay
9. Main Fuse 30 A
10. ECU Fuse 15 A
11. Relay Box
12. ECU Main Relay
13. Fuse Box 1
14. Ignition Fuse 15 A
15. Joint Connector F
16. Immobilizer Antenna
17. Immobilizer Amplifier
18. Ignition Switch

ECU Communication Error (Service Code 39)

ECU Communication Line Inspection

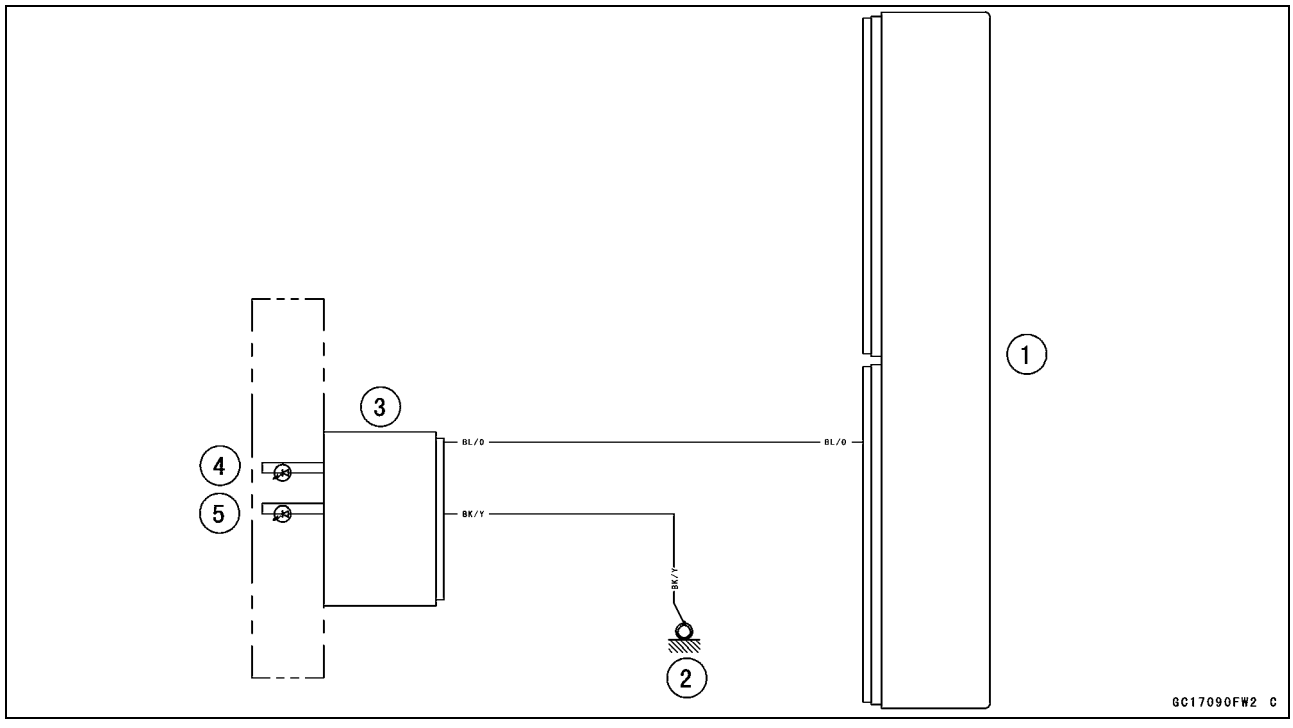


○When the data is not sent from the ECU to the meter unit for more than about 10 seconds, the service code 39 is displayed.
○The service code 39 is detected with meter unit.
● Remove the ECU and meter unit, check the wiring for continuity between main harness connector.
○Disconnect the ECU and meter unit connectors.

Wiring Inspection
ECU Connector [A] ←→ Meter Unit Connector [B]
BL/O lead (ECU terminal 26) [C]

★If the wiring is good, check the meter unit (see Meter Unit Inspection in the Electrical System chapter).
★If the meter unit is normal, replace the ECU (see ECU Removal/Installation).

ECU Communication Line Circuit



1. ECU
2. Frame Ground 1
3. Meter Unit
4. Yellow Engine Warning Indicator Light (LED)
5. Yellow KTRC Warning Indicator Light (LED)

Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54)

Stick Coil #1: Service Code 51
Stick Coil #2: Service Code 52
Stick Coil #3: Service Code 53
Stick Coil #4: Service Code 54

Stick Coil Removal/Installation

- Refer to the Stick Coil Removal/Installation in the Electrical System chapter.

Stick Coil Primary Winding Resistance Inspection

- Refer to the Stick Coil Inspection in the Electrical System chapter.

★If the reading is within the standard, check the input voltage (see Stick Coil Input Voltage Inspection).

Stick Coil Input Voltage Inspection

NOTE

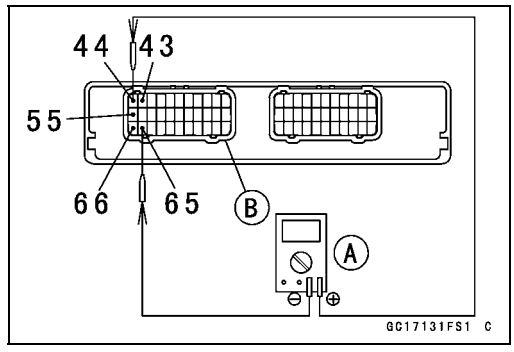
○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the ECU (see ECU Removal).

○Do not disconnect the ECU connectors.

- Connect a digital meter [A] to the connector [B] with the needle adapter set.

Special Tool - Needle Adapter Set: 57001-1457



Stick Coil Input Voltage
Connections to ECU Connector:
For Stick Coil #1
Digital Meter (+) → BK lead (terminal 44)
Digital Meter (–) → BK/Y lead (terminal 65)
For Stick Coil #2
Digital Meter (+) → BK/R lead (terminal 55)
Digital Meter (–) → BK/Y lead (terminal 65)
For Stick Coil #3
Digital Meter (+) → BK/O lead (terminal 66)
Digital Meter (–) → BK/Y lead (terminal 65)
For Stick Coil #4
Digital Meter (+) → BK/G lead (terminal 43)
Digital Meter (–) → BK/Y lead (terminal 65)

- Measure the input voltage to each primary winding of the stick coils with the engine stopped and with the connectors joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch to ON.

Input Voltage
Standard: Battery Voltage

Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54)

- Turn the ignition switch to OFF.

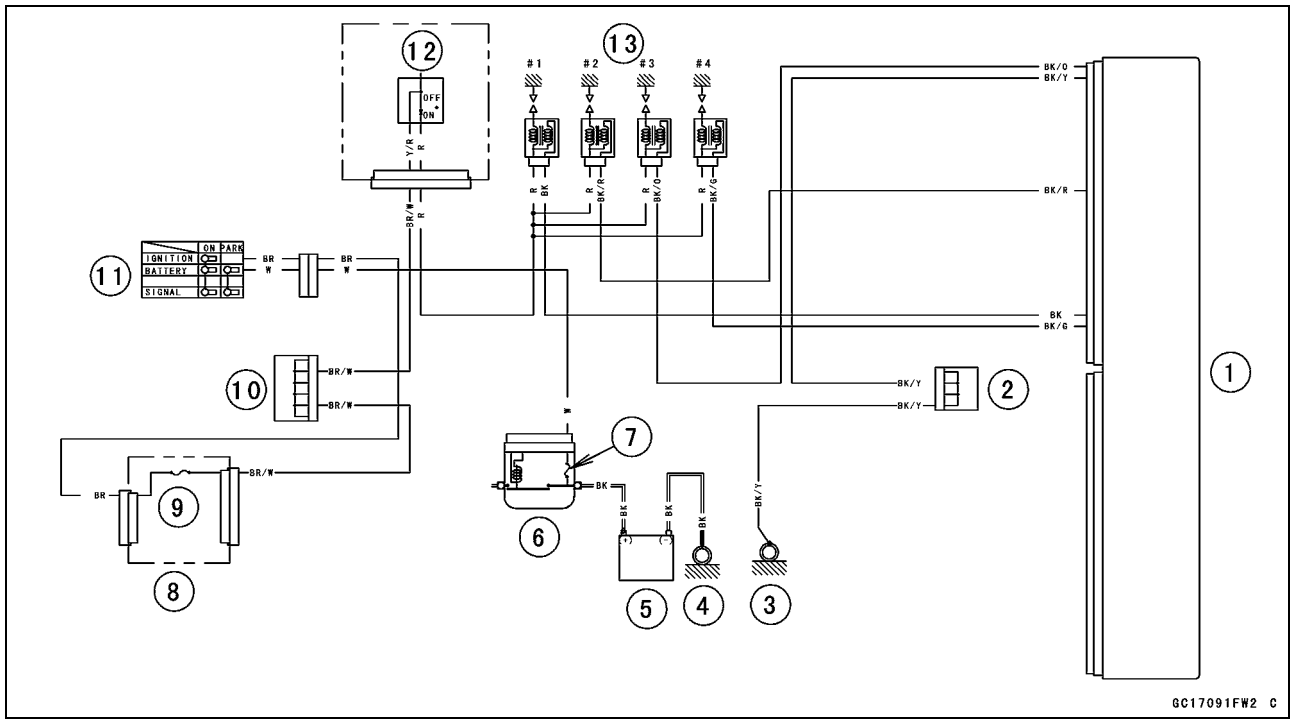
★If the input voltage is out of the standard, check the wiring for continuity (see Stick Coil Circuit).

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the input voltage is within the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

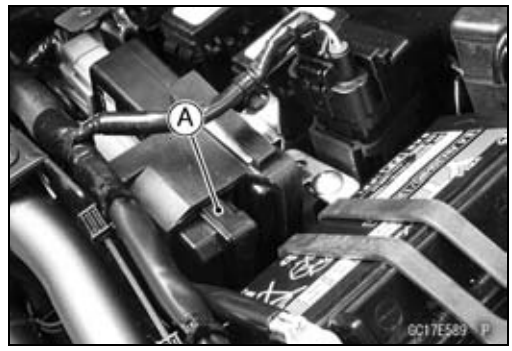
Stick Coil Circuit



1. ECU
2. Joint Connector D
3. Frame Ground 2
4. Engine Ground
5. Battery 12 V 8 Ah
6. Starter Relay
7. Main Fuse 30 A
8. Fuse Box 1
9. Ignition Fuse 15 A
10. Joint Connector F
11. Ignition Switch
12. Engine Stop Switch
13. Stick Coils

Radiator Fan Relay (Service Code 56)

Radiator Fan Relay Removal/Installation



○The radiator fan relay is built in the relay box [A].

● Refer to the Relay Box Removal in the Electrical System chapter.

Radiator Fan Relay Inspection

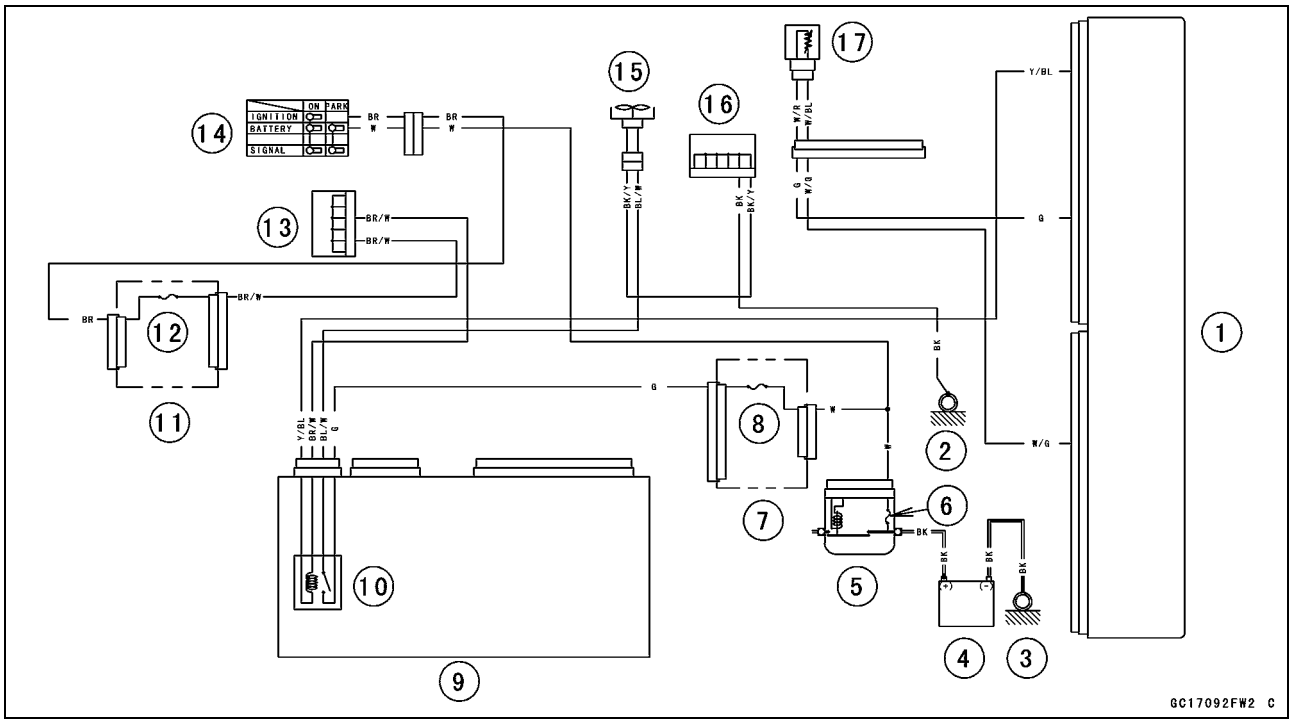
● Refer to the Relay Circuit Inspection in the Electrical System chapter.

★If the radiator fan relay is normal, check the wiring for continuity (see Radiator Fan Relay Circuit).

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Radiator Fan Relay Circuit



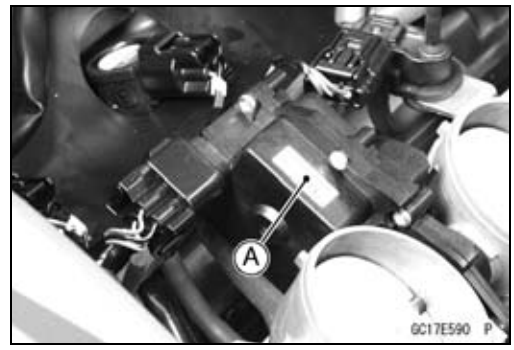
1. ECU
2. Frame Ground 3
3. Engine Ground
4. Battery 12 V 8 Ah
5. Starter Relay
6. Main Fuse 30 A
7. Fuse Box 2
8. Fan Fuse 15 A
9. Relay Box
10. Radiator Fan Relay
11. Fuse Box 1
12. Ignition Fuse 15 A
13. Joint Connector F
14. Ignition Switch
15. Fan Motor
16. Joint Connector C
17. Water Temperature Sensor

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Removal

NOTICE

Do not remove the subthrottle valve actuator [A] since it has been adjusted and set with precision at the factory.
Never drop the throttle body assy especially on a hard surface. Such a shock to the subthrottle valve actuator can damage it.



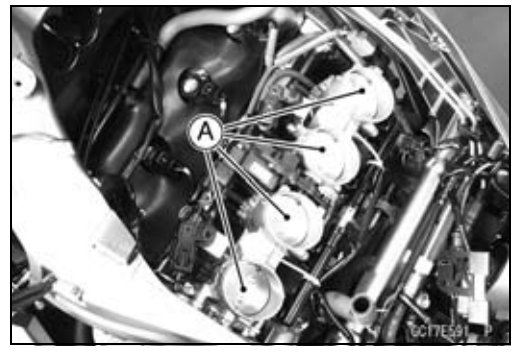
Subthrottle Valve Actuator Inspection

NOTE

○*Be sure the battery is fully charged.*

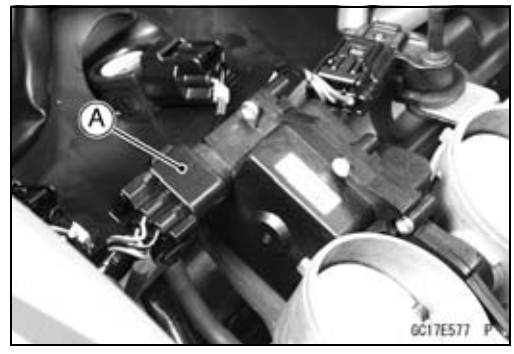
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Turn the ignition switch to ON.
- Check to see that all the subthrottle valves [A] open and close smoothly.
- Turn the ignition switch to OFF.

★If the subthrottle valves do not operate, check the subthrottle valve actuator resistance (see Subthrottle Valve Actuator Resistance Inspection).



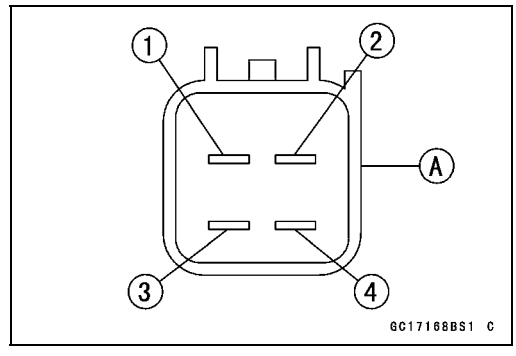
Subthrottle Valve Actuator Resistance Inspection

- Turn the ignition switch to OFF.
- Disconnect the subthrottle valve actuator connector [A].



- Connect a digital meter to the subthrottle valve actuator connector [A].
- Measure the subthrottle valve actuator resistance.

Subthrottle Valve Actuator Resistance
Connections: **Y/BK lead [1] ←→ P/BL lead [2]**
G lead [3] ←→ BK/O lead [4]
Standard: **About 5.2 ~ 7.8 Ω**

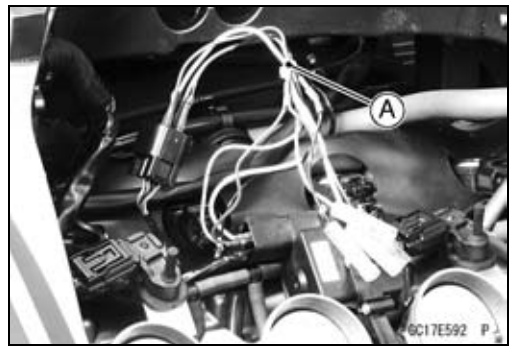


★If the reading is out of the standard, replace the throttle body assy.

★If the reading is within the standard, check the input voltage (see Subthrottle Valve Actuator Input Voltage Inspection).

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Input Voltage Inspection



NOTE

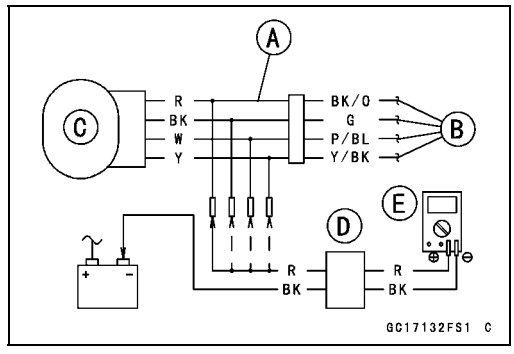
○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Disconnect the subthrottle valve actuator connector and connect the measuring adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Subthrottle Valve Actuator [C]

Special Tool - Measuring Adapter: 57001-1700

- Connect the peak voltage adapter [D] and a digital meter [E] to the measuring adapter leads.

Special Tool - Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B



Subthrottle Valve Actuator Input Voltage
Connections to Adapter:

(I) Digital Meter (+) → R (actuator BK/O) lead
Digital Meter (–) → Battery (–) terminal
(II) Digital Meter (+) → BK (actuator G) lead
Digital Meter (–) → Battery (–) terminal
(III) Digital Meter (+) → W (actuator P/BL) lead
Digital Meter (–) → Battery (–) terminal
(IV) Digital Meter (+) → Y (actuator Y/BK) lead
Digital Meter (–) → Battery (–) terminal

- Measure the actuator input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

Input Voltage
Standard: About DC 11.5 ~ 13.5 V

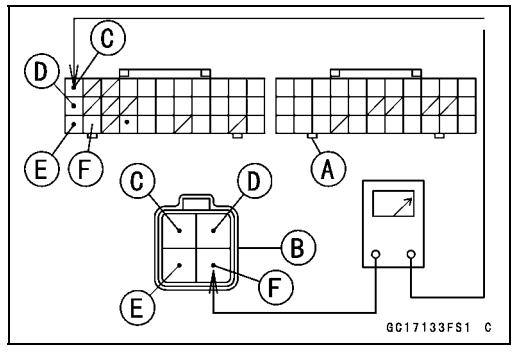
- Turn the ignition switch to OFF.

★If the reading is in specification, but the actuator does not operate, replace the throttle body assy.

★If the reading is out of the specification, remove the ECU and check the wiring for continuity between main harness connector.

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and actuator connectors.



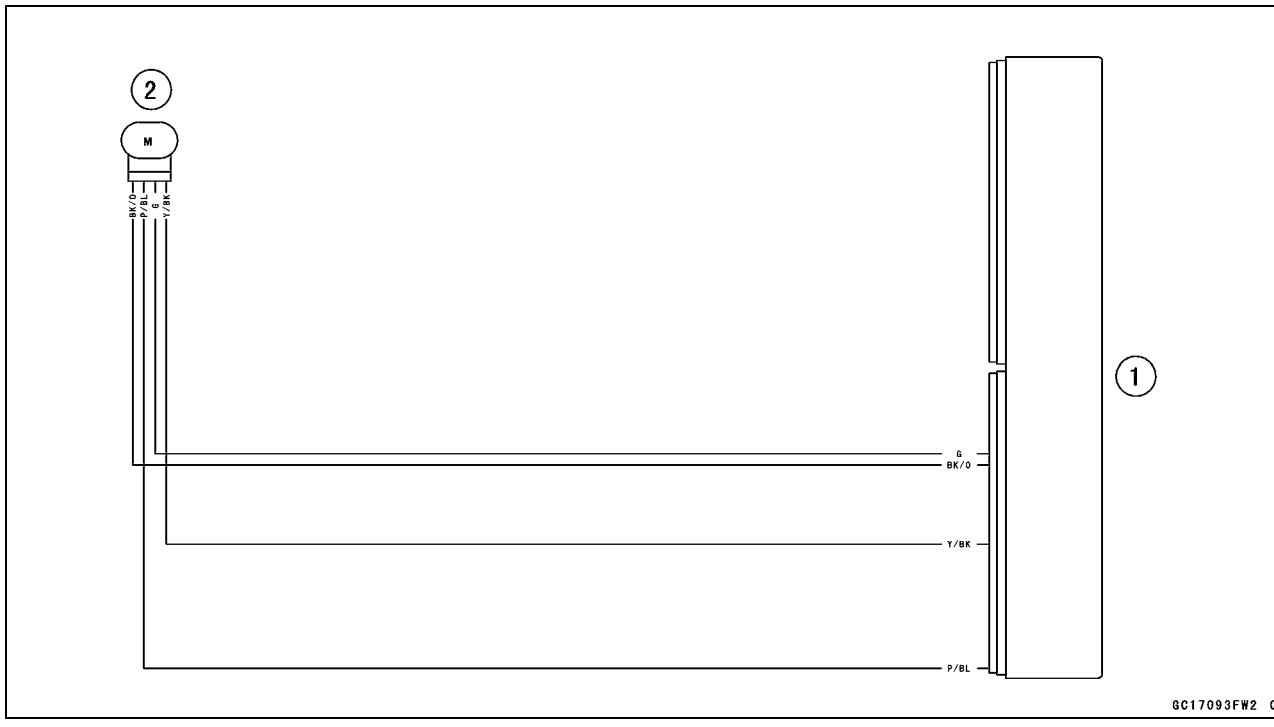
Wiring Continuity Inspection
ECU Connector [A] ←→
Subthrottle Valve Actuator Connector [B]
P/BL lead (ECU terminal 1) [C]
Y/BK lead (ECU terminal 12) [D]
BK/O lead (ECU terminal 23) [E]
G lead (ECU terminal 24) [F]

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Circuit



1. ECU
2. Subthrottle Valve Actuator

Air Switching Valve (Service Code 64)

Air Switching Valve Removal/Installation

- Refer to the Air Switching Valve Removal/Installation in the Engine Top End chapter.

Air Switching Valve Inspection

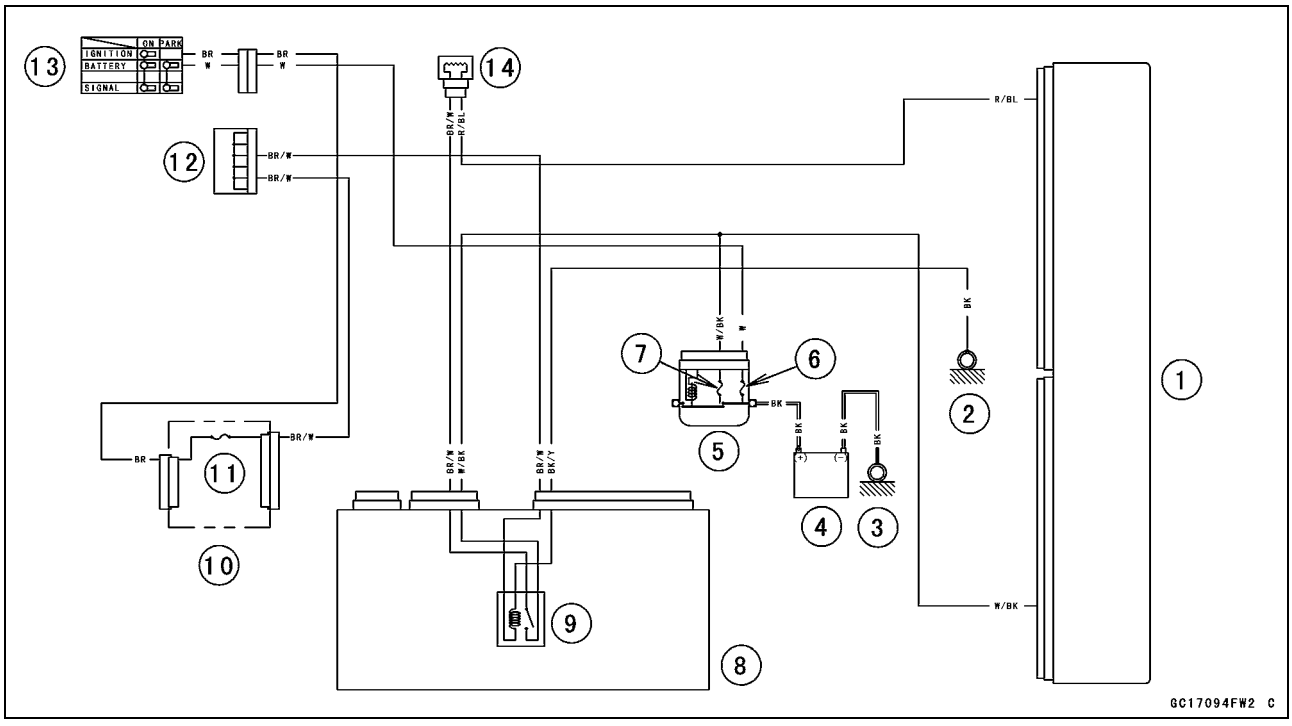
- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

★If the air switching valve is normal, check the wiring for continuity (see Air Switching Valve Circuit).

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Air Switching Valve Circuit



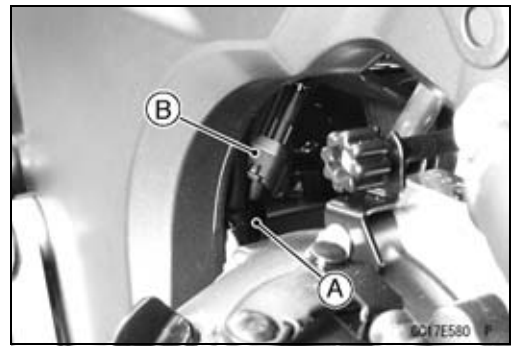
1. ECU
2. Frame Ground 3
3. Engine Ground
4. Battery 12 V 8 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Relay Box
9. ECU Main Relay
10. Fuse Box 1
11. Ignition Fuse 15 A
12. Joint Connector F
13. Ignition Switch
14. Air Switching Valve

Oxygen Sensor Heater (Service Code 67)

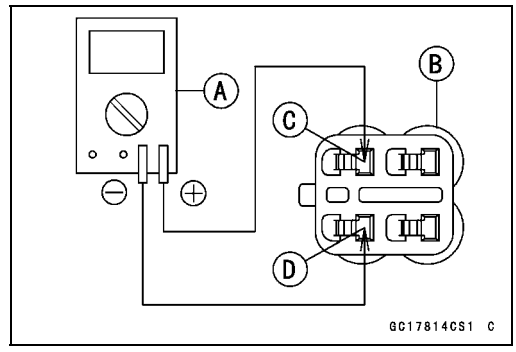
Oxygen Sensor Heater Removal/Installation

The oxygen sensor heater is built in the oxygen sensor. So, the heater itself can not be removed. Remove the oxygen sensor (see Oxygen Sensor Removal in the Electrical System chapter).

Oxygen Sensor Heater Resistance Inspection



- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Open the clamp [A], and pull out the oxygen sensor lead connector [B].
- Disconnect the oxygen sensor lead connector.

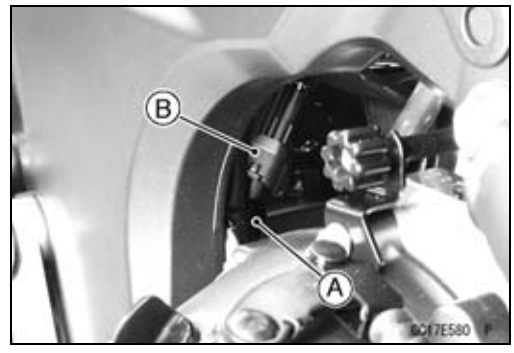


- Connect a digital meter [A] to the oxygen sensor lead connector [B].
- Measure the oxygen sensor heater resistance.

Oxygen Sensor Heaters Resistance
Connections: BK lead [C] ←→ BK lead [D]
Standard: 11.7 ~ 14.5 Ω at 20° C (68°F)

★If the reading is out of the standard, replace the sensor.
★If the reading is within the standard, check the power source voltage (see Oxygen Sensor Heater Power Source Voltage Inspection).

Oxygen Sensor Heater Power Source Voltage Inspection



NOTE

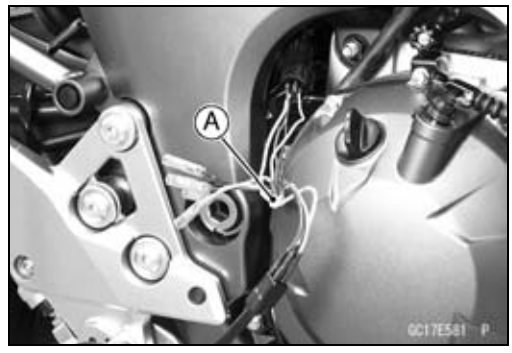
○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Open the clamp [A], and pull out the oxygen sensor lead connector [B].

Oxygen Sensor Heater (Service Code 67)

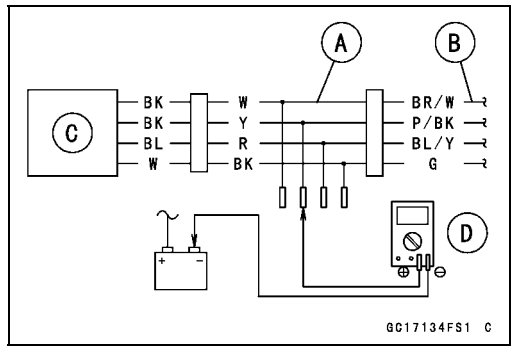
- Disconnect the oxygen sensor lead connector and connect the measuring adapter [A] between these connectors.
  [B] Main Harness
  [C] Oxygen Sensor

  Special Tool - Measuring Adapter: 57001-1700



- Connect a digital meter [D] to the measuring adapter lead.

  Oxygen Sensor Power Source Voltage
  Connections to Adapter:
  Digital Meter (+) → Y (sensor P/BK) lead
  Digital Meter (–) → Battery (–) terminal



- Measure the power source voltage with the engine stopped and with the connector joined.
- Turn the ignition switch to ON.

  Power Source Voltage
  Standard: Battery Voltage

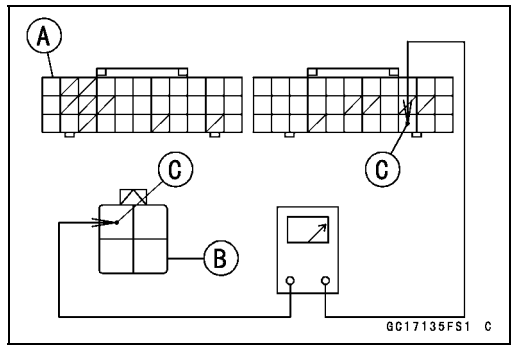
- Turn the ignition switch to OFF.

★If the reading is in specification, but the problem still exists, replace the ECU (see ECU Removal/Installation).

★If the reading is out of the standard, check the following.
ECU Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
Power Source Wiring (see Oxygen Sensor Circuit)

★If the fuse and wiring are good, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.



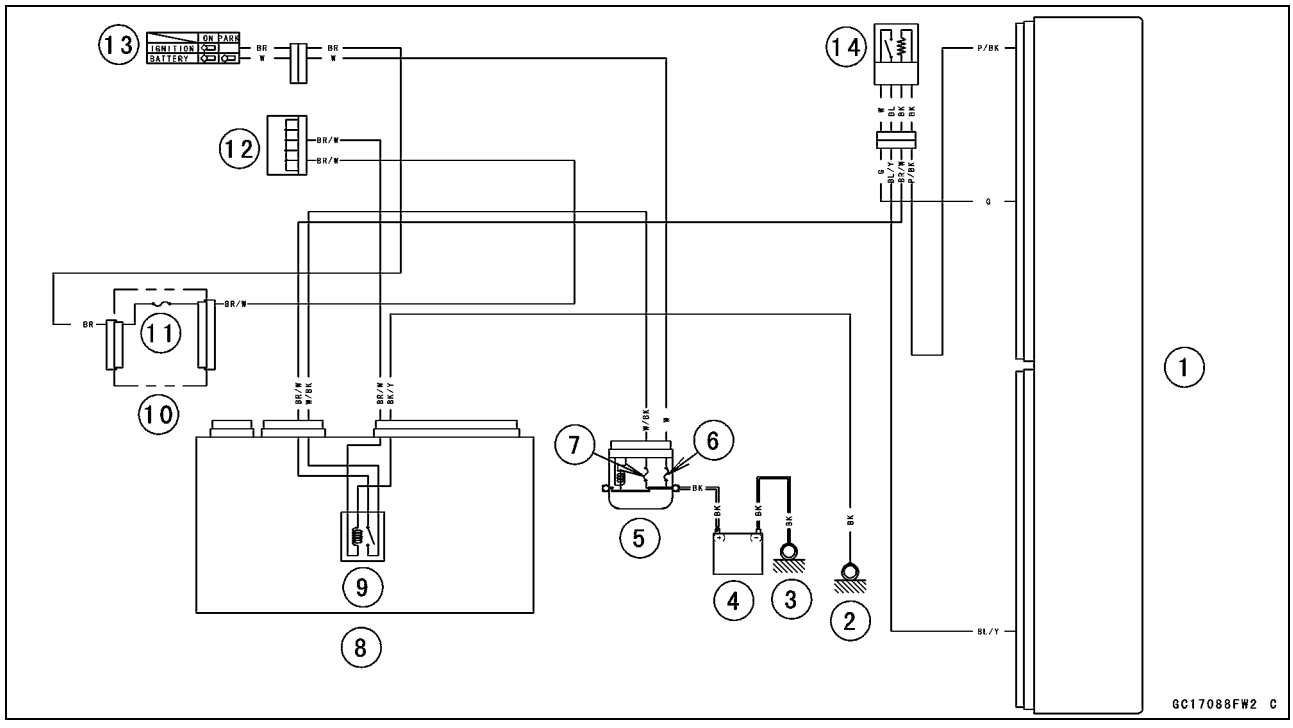
Wiring Inspection
ECU Connector [A] ←→
Oxygen Sensor Connector [B]
P/BK lead (ECU terminal 64) [C]

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Oxygen Sensor Heater (Service Code 67)

Oxygen Sensor Circuit



1. ECU
2. Frame Ground 3
3. Engine Ground
4. Battery 12 V 8 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Relay Box
9. ECU Main Relay
10. Fuse Box 1
11. Ignition Fuse 15 A
12. Joint Connector F
13. Ignition Switch
14. Oxygen Sensor

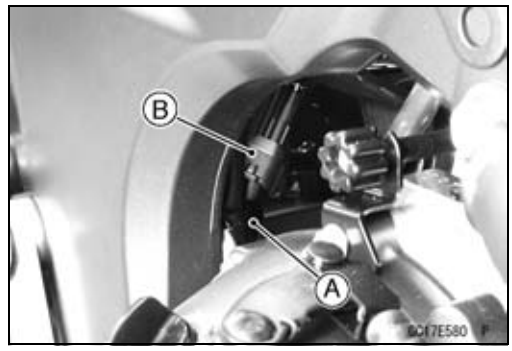
Oxygen Sensor - Incorrect Output Voltage (Service Code 94)

Oxygen Sensor Removal/Installation

- Refer to the Oxygen Sensor Removal/Installation in the Electrical System chapter.

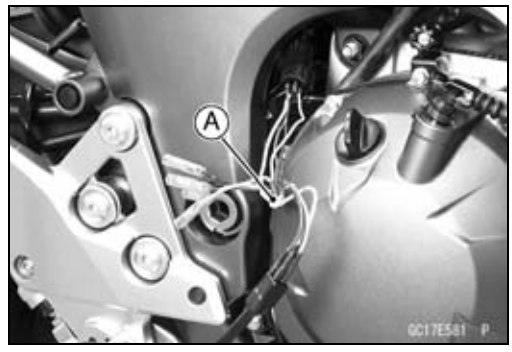
Oxygen Sensor Inspection

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch to OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Open the clamp [A], and pull out the oxygen sensor lead connector [B].



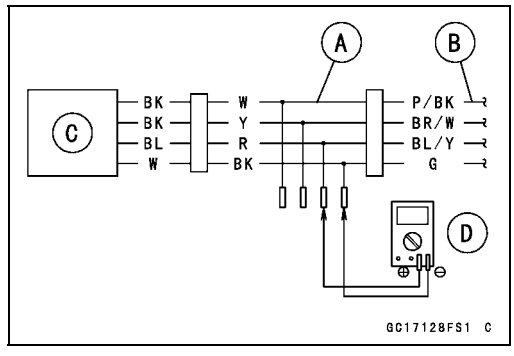
- Disconnect the oxygen sensor lead connector (4 pins connector) and connect the measuring adapter [A] between these connectors.
  [B] Main Harness
  [C] Oxygen Sensor

  Special Tool - Measuring Adapter: 57001-1700



- Connect a digital meter [D] to the measuring adapter leads.

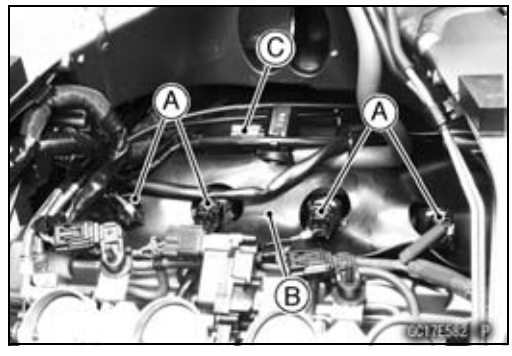
  Oxygen Sensor Output Voltage
  Connections to Adapter:
  Digital Meter (+) → R (sensor BL/Y) lead
  Digital Meter (−) → BK (sensor G) lead



- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal)

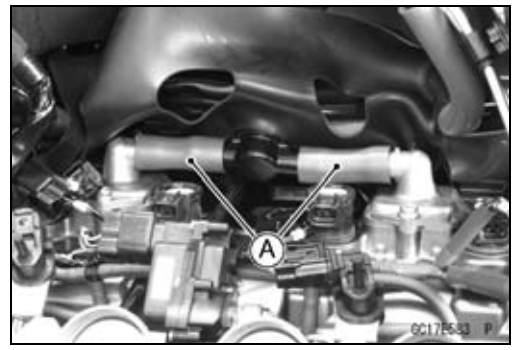
- Disconnect the stick coil connectors [A].
- Pull up the rubber cover [B] forward.

○Do not disconnect the air switching valve connector [C].

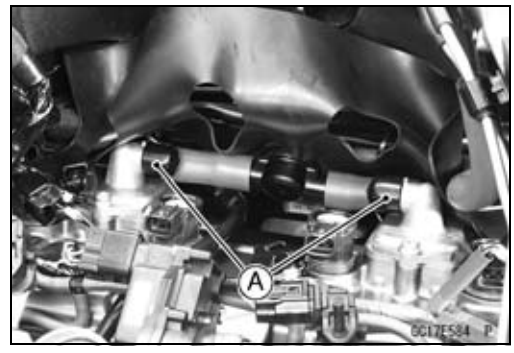


Oxygen Sensor - Incorrect Output Voltage (Service Code 94)

- Separate the air switching valve hoses [A] from the air suction valve covers.

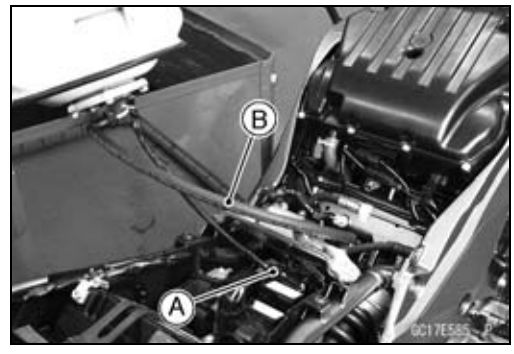


- Install the suitable plugs [A] on the fitting of the air suction valve covers, and shut off the secondary air.
- Reposition the rubber cover and connect the stick coil connectors.
- Install the air cleaner housing temporarily (see Air Cleaner Housing Installation).



- Remove the fuel hose (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Connect the following parts temporary.
  Fuel Pump Lead Connector [A]
  Fuel Hose [B]

Special Tool - Fuel Hose: 57001-1607

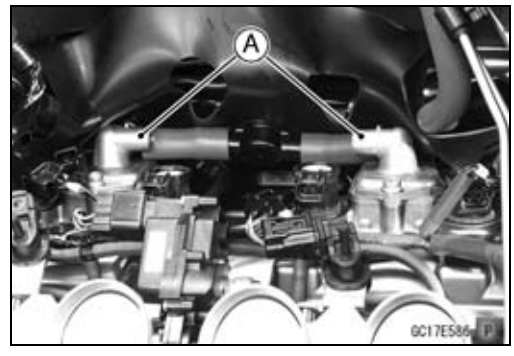


- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

Output Voltage (with Plugs, Rich)
Standard: DC 0.7 V or more

- Next, remove the air cleaner housing and pull up the rubber cover to take out the plugs from the fittings [A] of the air suction valve covers.
- Reposition the rubber cover and install the air cleaner housing.
- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

Output Voltage (without Plugs, Lean)
Standard: DC 0.2 V or less

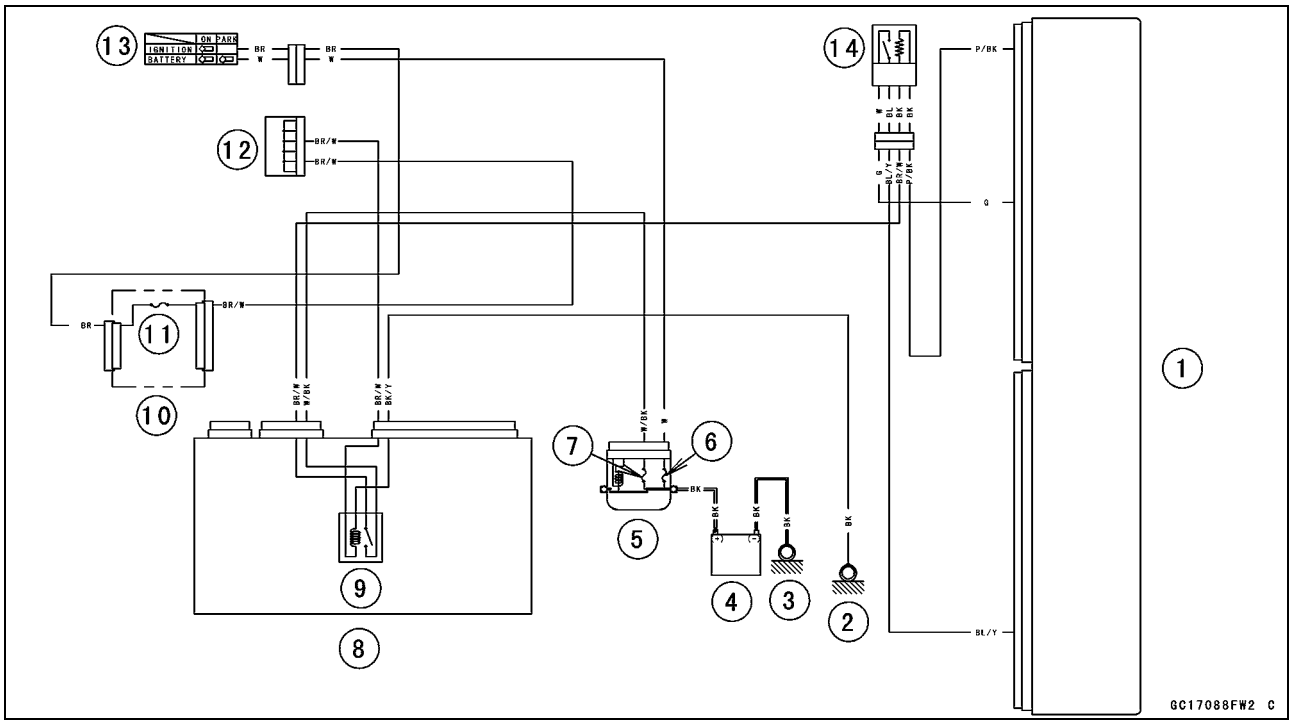


- Turn the ignition switch to OFF.

Oxygen Sensor - Incorrect Output Voltage (Service Code 94)

★If the reading is out of the standard (with plugs: DC 0.7 V or more, without plugs: DC 0.2 V or less), check the following.
Fuel Pressure (see Fuel Pressure Inspection)
Fuel Injector (see Fuel Injectors section)
★If the fuel pressure and fuel injectors are good, replace the sensor.
★If the reading is within the standard (with plugs: DC 0.7 V or more, without plugs: DC 0.2 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Oxygen Sensor Circuit



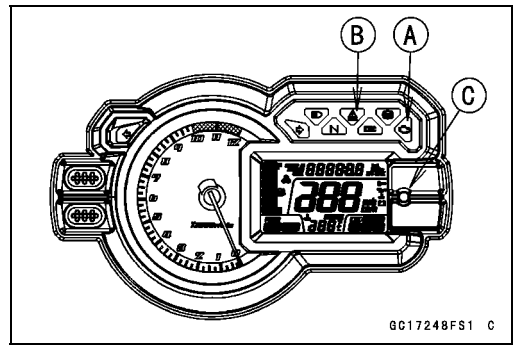
1. ECU
2. Frame Ground 3
3. Engine Ground
4. Battery 12 V 8 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Relay Box
9. ECU Main Relay
10. Fuse Box 1
11. Ignition Fuse 15 A
12. Joint Connector F
13. Ignition Switch
14. Oxygen Sensor

Warning Indicator Light (LED)

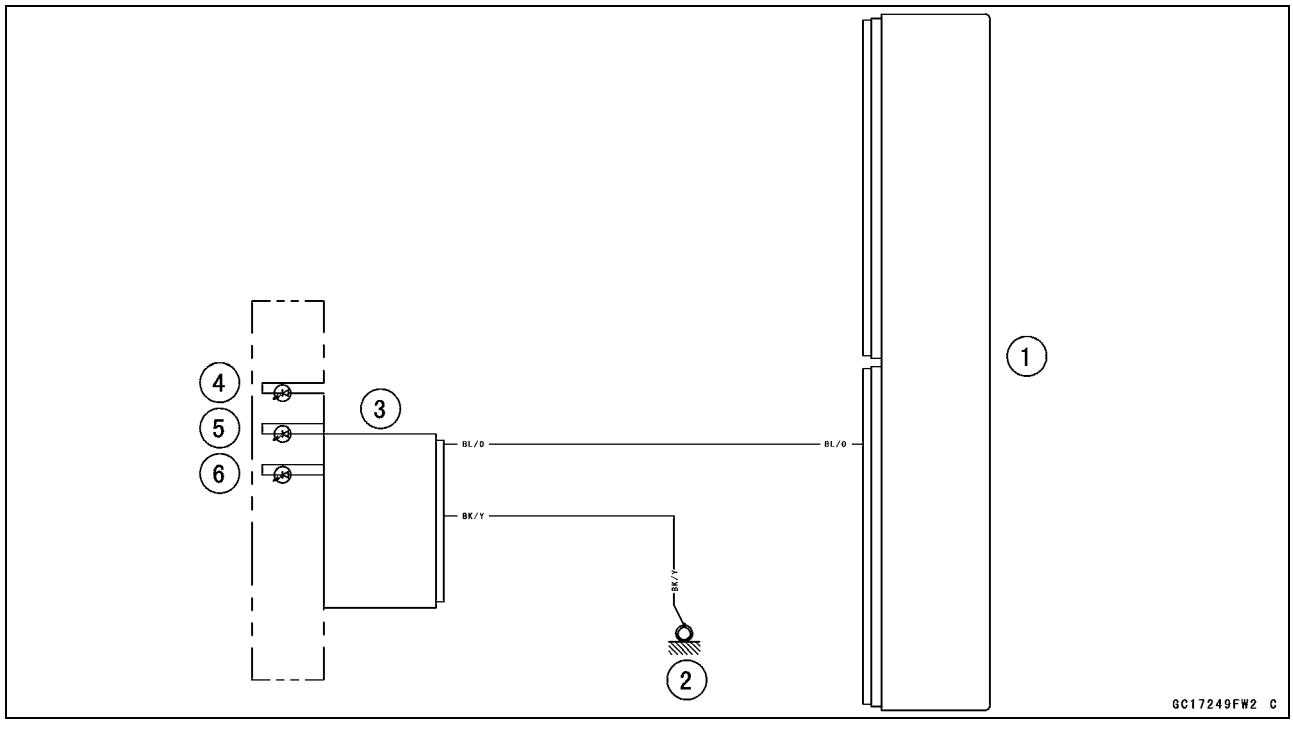
Yellow Engine Warning/Yellow KTRC Warning/Red Warning Indicator Light (LED) Inspection

Yellow Engine Warning Indicator Light [A]
Yellow KTRC Warning Indicator Light [B]
Red Warning Indicator Light [C]

- Refer to the Meter Unit Inspection in the Electrical System chapter for the warning indicator light (LED) inspection.



Red Warning Indicator Light (LED) (Immobilizer) Circuit

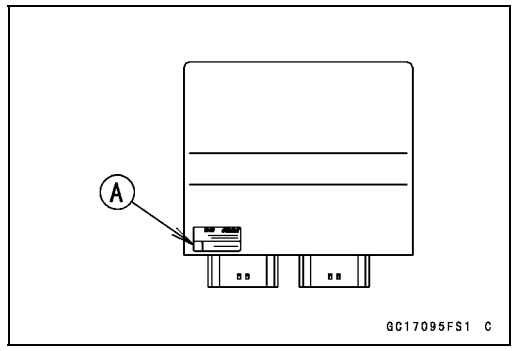


1. ECU
2. Frame Ground 1
3. Meter Unit
4. Yellow Engine Warning Light (LED)
5. Yellow KTRC Warning Light (LED)
6. Red Warning Indicator Light (LED)

Battery/Oil Pressure/Water Temperature/Immobilizer (Equipped Model)

ECU

ECU Identification



○Most countries have their own regulations, so each ECU has different characteristic. So, do not confuse ECU with each other and use only the ECU for your model. Otherwise, the motorcycle cannot clear the regulation.

ECU Identification

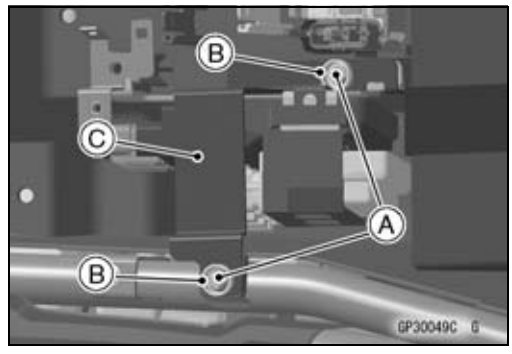
Part Number [A]	Specification
21175-0735	WVTA (Full H), with immobilizer GB WVTA (Full H), with immobilizer Australia, with immobilizer Southeast Asia B2, with immobilizer
21175-0753	WVTA (78.2H), with immobilizer
21175-0754	Brazil, with immobilizer
21175-0781	Canada, without immobilizer

Full: Full Power
H: Honeycomb Type Catalyst
78.2: Maximum Horsepower 78.2 kW (106.3 PS)

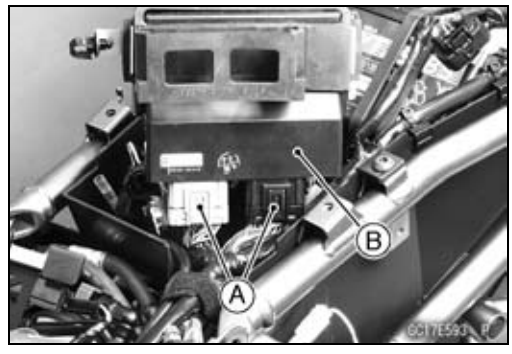
ECU Removal

NOTICE
Never drop the ECU especially on a hard surface. Such a shock to the ECU can damage it.

- Remove:
  Seat (see Seat Removal in the Frame chapter)
- For WVTA (78.2 H) and GB WVTA (FULL H) Models, using a small chisel or suitable tool, remove the screws [A], washers [B] and ECU guard [C].



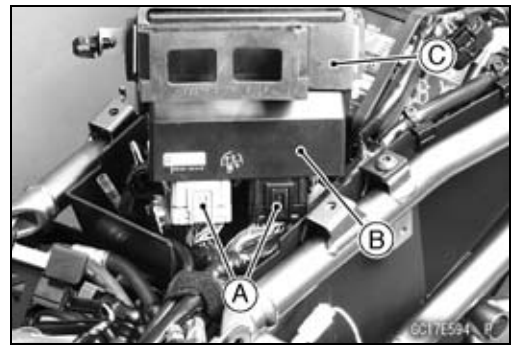
- Remove:
  Relay Box (see Relay Box Removal in the Electrical System chapter)
  ECU Connectors [A]
  ECU [B]



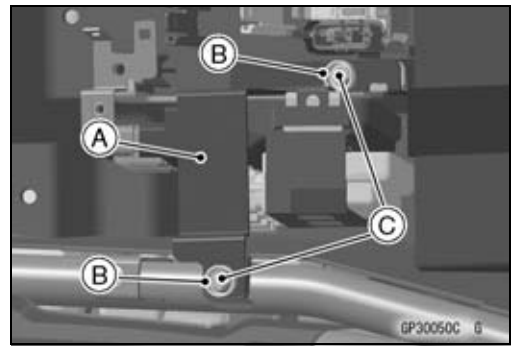
ECU

ECU Installation

- Connect the ECU connectors [A].
- Install the ECU [B] into the rubber protector [C].
- Install the relay box (see Relay Box Installation in the Electrical System chapter).



- For WVTA (78.2 H) and GB WVTA (FULL H) Models, install the ECU guard [A] and Washers [B].



NOTICE
Do not pinch the leads.

- For WVTA (78.2 H) and GB WVTA (FULL H) Models, tighten the new screws [C] using the Kawasaki genuine screws of which threads are coated with locking agent.

ECU Power Supply Inspection

- Visually inspect the ECU connectors.

★If the connector is clogged with mud or dust, blow it off with compressed air.

- Remove the ECU (see ECU Removal).
- Visually inspect the terminals [A] of the ECU connectors.

★If the terminals of the main harness connectors are damaged, replace the main harness.

★If the terminals of the ECU connectors are damaged, replace the ECU.

- Turn the ignition switch to OFF.
- Disconnect the ECU connectors [A].
- Set the hand tester [B] to the × 1 Ω range and check the following wiring for continuity.

Special Tool - Hand Tester: 57001-1394

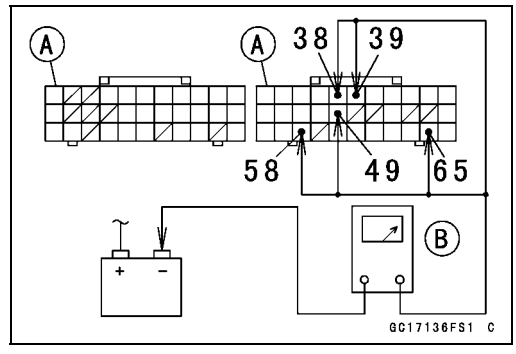
ECU Grounding Inspection
Connections:

(I) BK/BL lead (ECU terminal 38
BK/Y leads (ECU terminal 39, 65)
G lead (ECU terminal 49)
P lead (ECU terminal 58) **←→ Battery (–) Terminal**

(II) Engine Ground **←→ Battery (–) Terminal**

Criteria:

Both: 0 Ω



★If no continuity, check the connectors, the engine ground lead, or main harness, and repair or replace them if necessary.

ECU

★If the wiring is good, check the power source voltage of the ECU.

NOTE

○*Be sure the battery is fully charged.*

- Connect the ECU and relay box connectors.
- Connect a digital meter [A] to the connectors [B] with the needle adapter set.

Special Tool - Needle Adapter Set: 57001-1457

ECU Power Supply Inspection

Connections:

(I) Digital Meter (+) → Terminal 6 (BR/W)

Digital Meter (–) → Battery (–) terminal

(II) Digital Meter (+) → Terminal 7 (W/BK)

Digital Meter (–) → Battery (–) terminal

Ignition Switch OFF:

Terminal 6 (BR/W): 0 V

Terminal 7 (W/BK): Battery Voltage

Ignition Switch ON:

Both: Battery Voltage

★If the reading is out of the specification, check the following.

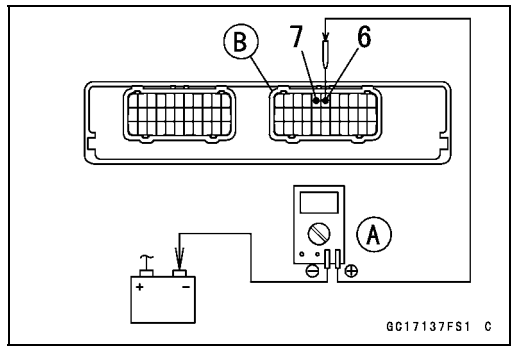
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)

ECU Fuse 15 A (see Fuse Inspection Electrical System chapter)

ECU Main Relay (see Relay Circuit Inspection in the Electrical System chapter)

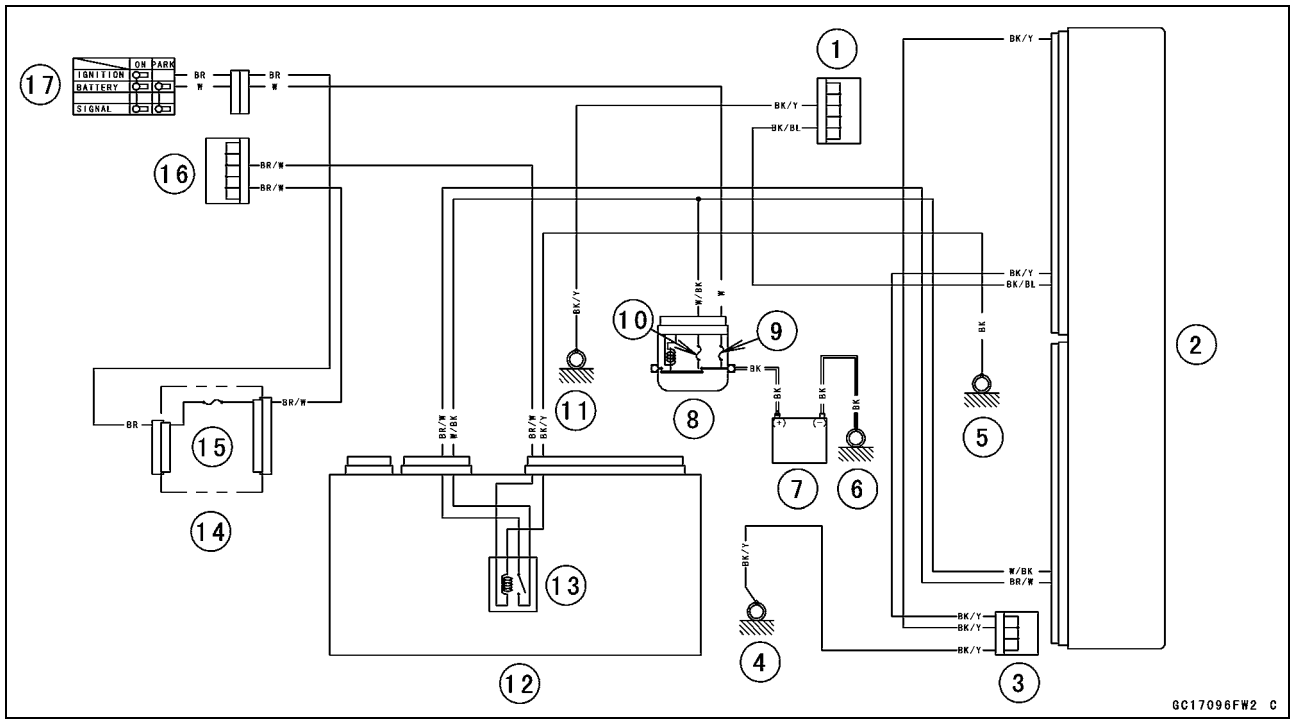
Power Source Wiring (see ECU Power Source Circuit)

★If the fuse, wiring and relay are good, replace the ECU (see ECU Removal/Installation).



ECU

ECU Power Source Circuit



1. Joint Connector E
2. ECU
3. Joint Connector D
4. Frame Ground 2
5. Frame Ground 3
6. Engine Ground
7. Battery 12 V 8 Ah
8. Starter Relay
9. Main Fuse 30 A
10. ECU Fuse 15 A
11. Frame Ground 1
12. Relay Box
13. ECU Main Relay
14. Fuse Box 1
15. Ignition Fuse 15 A
16. Joint Connector F
17. Ignition Switch

DFI Power Source

ECU Fuse Removal

- Refer to the 15 A ECU Fuse Removal in the Electrical System chapter.

ECU Fuse Installation

★If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.

- Refer to the Fuse Installation in the Electrical System chapter.

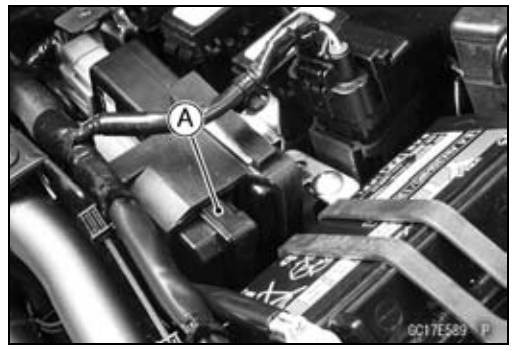
ECU Fuse Inspection

- Refer to the Fuse Inspection in the Electrical System chapter.

ECU Main Relay Removal/Installation

○The ECU main relay is built in the relay box [A].

- Refer to the Relay Box Removal in the Electrical System chapter.



ECU Main Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.

Fuel Line

Fuel Pressure Inspection

NOTE

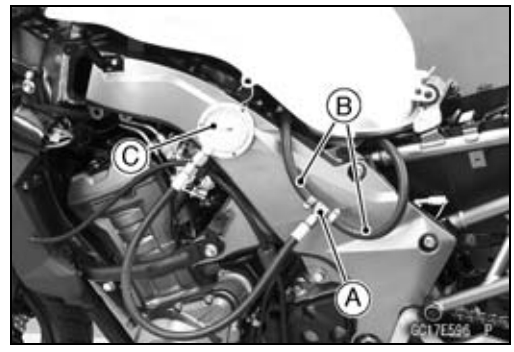
○*Be sure the battery is fully charged.*

- Remove:
  Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Support the fuel tank with a suitable bar (see Fuel Tank Removal).

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.



- Install the fuel pressure gauge adapter [A] and fuel hoses (Special Tool: 57001-1607) [B] between the fuel outlet pipe and delivery pipe.
- Secure the fuel hoses with the clamps.
- Connect the pressure gauge [C] to the fuel pressure gauge adapter.

Special Tools - Oil Pressure Gauge, 5 kgf/cm²: 57001-125
Fuel Pressure Gauge Adapter: 57001-1593
Fuel Hose: 57001-1607

⚠ WARNING

Fuel is extremely flammable and can be explosive under certain conditions resulting in serious injury or death. Do not try to start the engine with the fuel hoses disconnected.

- Connect the fuel pump lead connector.
- Turn the engine stop switch run position.
- Turn the ignition switch to ON.

○The fuel pump should operate for 3 seconds, and then should stop.

NOTE

○*After turning on the engine stop switch and ignition switch, inspect the fuel leakage from the connected portion of the special tools.*

NOTICE

Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.

Fuel Line

- Start the engine, and let it idle.
- Measure the fuel pressure with the engine idling.

Fuel Pressure (with Engine Idling)
Standard: 294 kPa (3.0 kgf/cm², 43 psi)

NOTE

○*The gauge needle will fluctuate. Read the pressure at the average of the maximum and minimum indications.*

- Turn the ignition switch to OFF.

★If the fuel pressure is much higher than specified, replace the fuel pump because the fuel pressure regulator in the fuel pump have been clogged or stuck.

★If the fuel pressure is much lower than specified, check the following.
Fuel Line Leakage (see Fuel Injector Fuel Line Inspection)
Amount of Fuel Flow (see Fuel Flow Rate Inspection)

- After above checks, measure the fuel pressure again.
- Remove the fuel pressure gauge, hoses and adapter.
- Install:
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Fuel Tank (see Fuel Tank Installation)
- Confirm that the drain hose and clamp are installed securely and run the hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Start the engine and check for fuel leakage.

Fuel Flow Rate Inspection

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch to OFF. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Wait until the engine cools down.
- Prepare a fuel hose (Special Tool: 57001-1607) and a measuring cylinder.

Special Tool - Fuel Hose: 57001-1607

- Support the fuel tank with a suitable bar (see Fuel Tank Removal).

Fuel Line

- Open the fuel tank cap [A] to lower the pressure in the tank.
- Remove the fuel hose from the fuel pump (see Fuel Tank Removal).

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.

⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.

- Connect the prepared fuel hose [A] to the fuel outlet pipe.
- Secure the fuel hose with a clamp.
- Insert the fuel hose into the measuring cylinder [B].

⚠ WARNING

Wipe off spilled out fuel immediately.
Be sure to hold the measuring cylinder vertical.

- Close the fuel tank cap.
- Turn the engine stop switch to run position.
- Turn the ignition switch to ON.

○The fuel pump should operate for 3 seconds, and then should stop.

NOTICE

Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.

- Measure the discharge for 3 seconds.

○Repeat this operation several times.

Amount of Fuel Flow
Standard: 50 mL (1.7 US oz.) or more for 3 seconds

- Turn the ignition switch to OFF.

★If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).

- Install the fuel tank (see Fuel Tank Installation).
- Confirm that the drain hose and clamp are installed securely and run the hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Start the engine and check for fuel leakage.

Fuel Pump

Fuel Pump Removal

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch to OFF. Disconnect the battery (–) terminal. To avoid fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

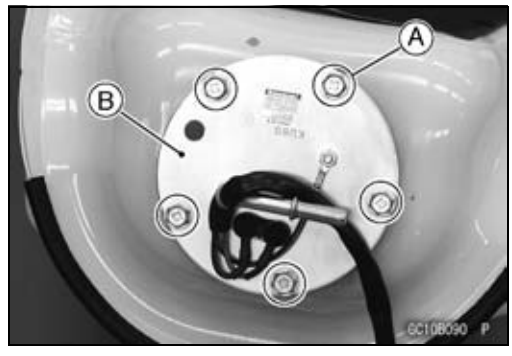
NOTICE

Never drop the fuel pump especially on a hard surface. Such a shock to the pump can damage it.

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see Fuel Tank Removal).

○Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump. Plug the fuel pipe of the fuel tank.

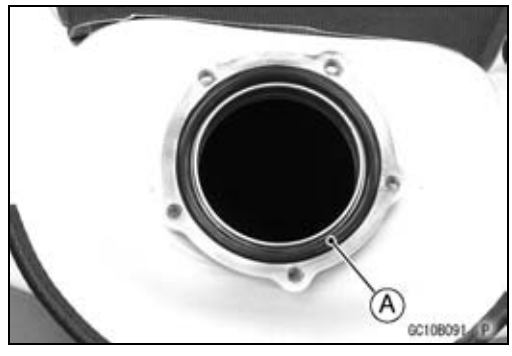
- Turn the fuel tank upside down.
- Remove the fuel pump bolts [A], and take out the fuel pump [B].



NOTICE

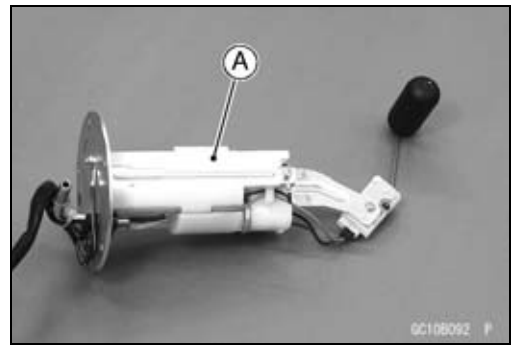
Do not pull the leads of the fuel pump. If they are pulled, the lead terminals may be damaged.

- Discard the fuel pump gasket [A].

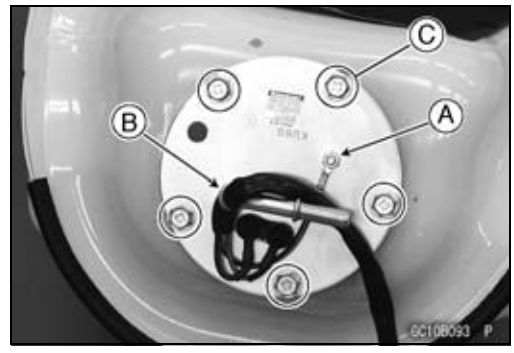


Fuel Pump

Fuel Pump Installation



- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.



- Check that the fuel pump terminal [A] and band [B] are in place.
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts [C] to a snug fit.
- Tighten the fuel pump bolts alternating diagonally.

  Torque - Fuel Pump Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Tighten the pump bolts again to check the tightness.

Fuel Pump Operation Inspection

NOTE

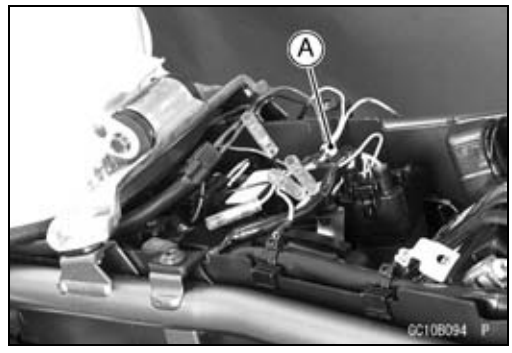
○*Be sure the battery is fully charged.*

- Turn the engine stop switch to run position.
- Turn the ignition switch to ON and make sure that the fuel pump operates (make light sounds) for 3 seconds, and then stops.
- Turn the ignition switch to OFF.

★If the pump does not operate as described above, check the operating voltage (see Fuel Pump Operating Voltage Inspection).

Fuel Pump

Fuel Pump Operating Voltage Inspection



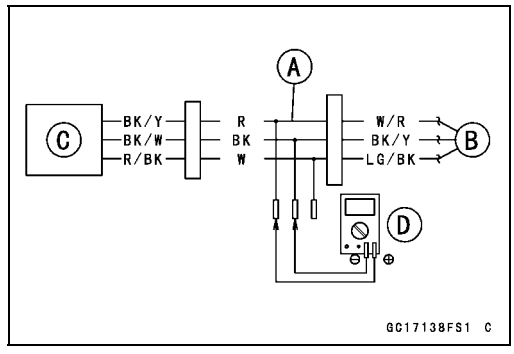
NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Fuel Pump [C]

Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter [D] to the measuring adapter leads.



Fuel Pump Operating Voltage
Connections to Adapter:
Digital Meter (+) → R (pump BK/Y) lead
Digital Meter (–) → BK (pump R/W) lead

- Measure the operating voltage with engine stopped and with the connector joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch to ON.

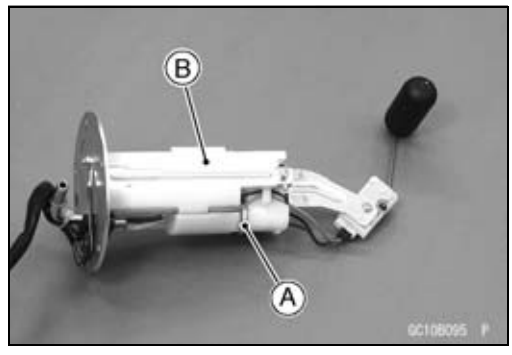
Operating Voltage
Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch to OFF.

★If the reading is not the standard, check the ECU main relay and fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
★If the main relay and pump relay are normal, check the wiring for continuity (see Fuel Pump Circuit).
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

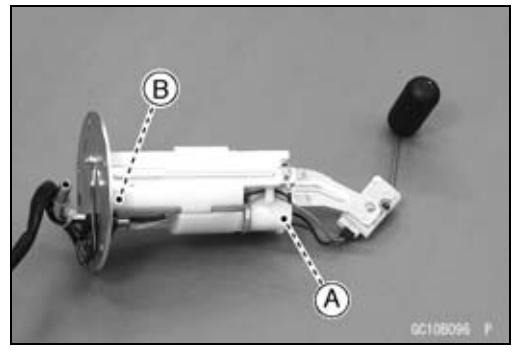
Pressure Regulator Removal

○The pressure regulator [A] is built into the fuel pump [B] and can not be removed.



Fuel Pump

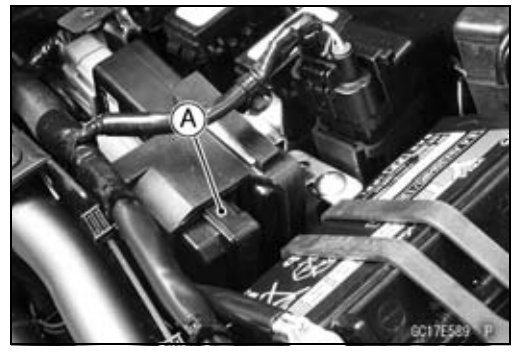
Pump Screen, Fuel Filter Cleaning



○The pump screen [A] and fuel filter [B] are built into the pump and can not be cleaned or checked.

★If the pump screen or fuel filter is suspected of clogging or being damaged, replace it with the fuel pump as a set.

Fuel Pump Relay Removal/Installation



○The fuel pump relay is built in the relay box [A].

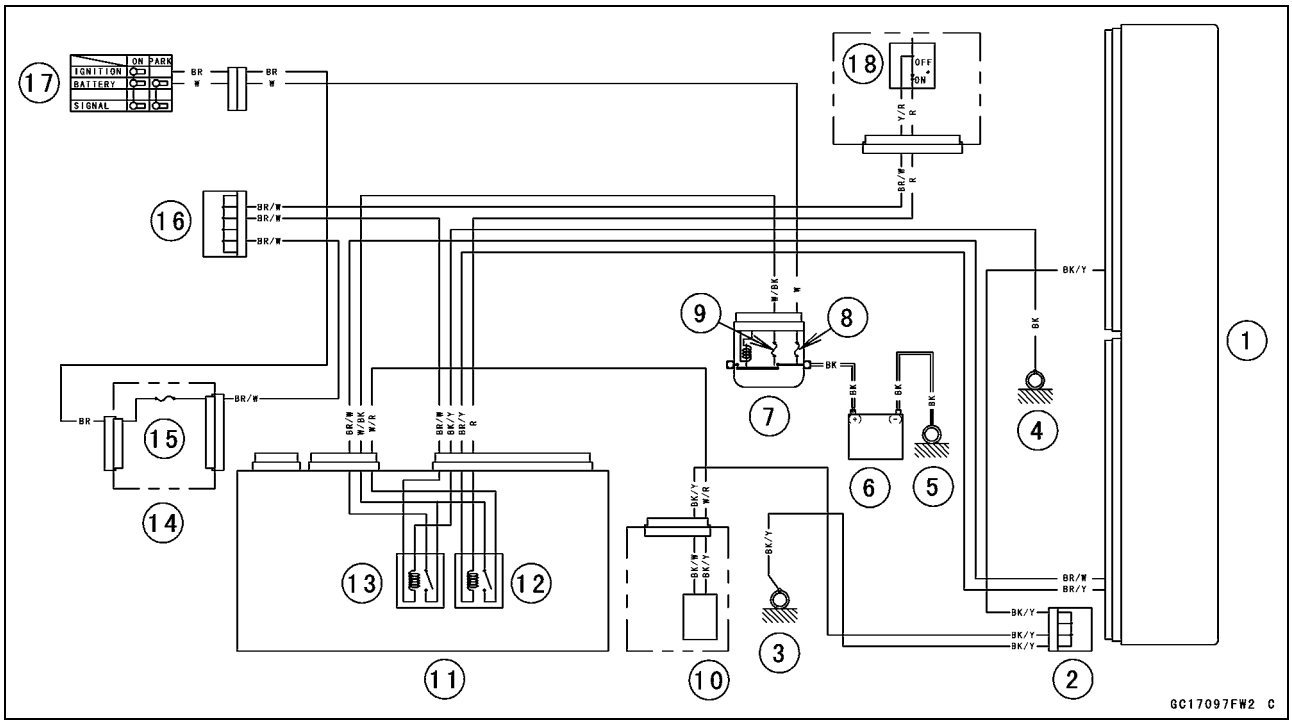
● Refer to the Relay Box Removal in the Electrical System chapter.

Fuel Pump Relay Inspection

● Refer to the Relay Circuit Inspection in the Electrical System chapter.

Fuel Pump

Fuel Pump Circuit



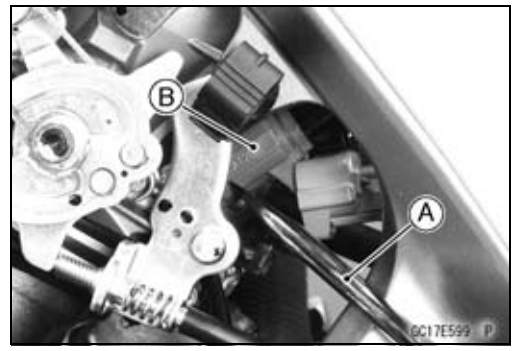
1. ECU
2. Joint Connector D
3. Frame Ground 2
4. Frame Ground 3
5. Engine Ground
6. Battery 12 V 8 Ah
7. Starter Relay
8. Main Fuse 30 A
9. ECU Fuse 15 A
10. Fuel Pump
11. Relay Box
12. Fuel Pump Relay
13. ECU Main Relay
14. Fuse Box 1
15. Ignition Fuse 15 A
16. Joint Connector F
17. Ignition Switch
18. Engine Stop Switch

Fuel Injectors

Fuel Injector Removal/Installation

● Refer to the Throttle Body Assy Disassembly/Assembly.

Fuel Injector Audible Inspection

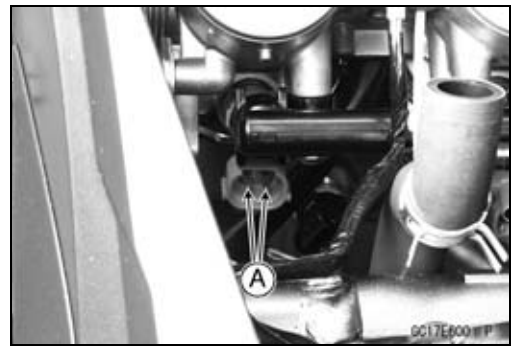


NOTE

○*Be sure the battery is fully charged.*

● Remove the left side cover (see Side Cover Removal in the Frame chapter).
● Start the engine, and let it idle.
● Apply the tip of a screwdriver [A] to the fuel injector [B]. Put the grip end onto your ear, and listen whether the fuel injector is clicking or not.
○A sound scope can also be used.
○The click interval becomes shorter as the engine speed rises.
● Do the same for the other fuel injectors.
★If all the fuel injectors click at a regular intervals, the fuel injectors are normal.
● Turn the ignition switch to OFF.
★If any fuel injector does not click, check the fuel injector resistance (see Fuel Injector Resistance Inspection).

Fuel Injector Resistance Inspection



● Remove the throttle body assy with the connectors installed (see Throttle Body Assy Removal).
● Disconnect the injector connector.
● Connect a digital meter to the terminals [A] of the injector.
● Measure the fuel injector resistance.

Fuel Injector Resistance
Connections:
For Fuel Injector #1
W/R ←→ BL/BK terminal
For Fuel Injector #2
W/R ←→ BL/R terminal
For Fuel Injector #3
W/R ←→ BL/O terminal
For Fuel Injector #4
W/R ←→ BL/G terminal

Standard: About 11.7 ~ 12.3 Ω at 20°C (68°F)

★If the reading is out of the standard, replace the injector.

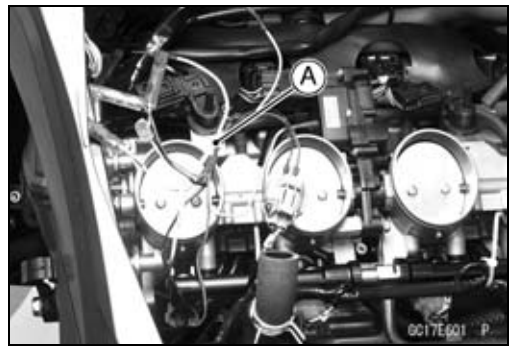
Fuel Injectors

Fuel Injector Power Source Voltage Inspection

NOTE

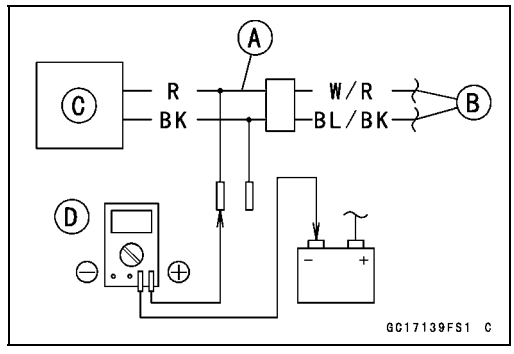
○*Be sure the battery is fully charged.*

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Turn the ignition switch to OFF.
- Disconnect the injector connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Fuel Injector #1 [C]



Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter [D] to the measuring adapter lead.



Fuel Injector Power Source Voltage
Connections to Adapter:
For Fuel Injector #1, #2, #3, #4
Digital Meter (+) → R (injector W/R) lead
Digital Meter (–) → Battery (–) terminal

- Measure the power source voltage with the engine stopped.
- Turn the engine stop switch to run position.
- Turn the ignition switch to ON.

Power Source Voltage
Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch to OFF.

★If the reading is not the standard, check the ECU main relay and fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

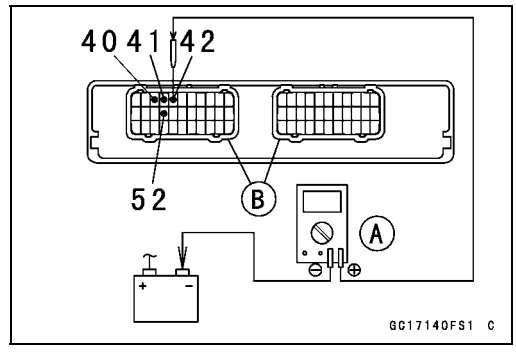
★If the main relay and pump relay are normal, check the wiring (see Fuel Injector Circuit).

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Fuel Injectors

Fuel Injector Output Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch to OFF.
- Remove the ECU (see ECU Removal).

○Do not disconnect the ECU connector.
○Connect the relay box connectors.

- Connect a digital meter [A] to the connectors [B] with the needle adapter set.

Special Tool - Needle Adapter Set: 57001-1457

Fuel Injector Output Voltage
Connections to ECU Connector:
For Fuel Injector #1
Digital Meter (+) → BL/BK lead (ECU terminal 42)
Digital Meter (–) → Battery (–) terminal
For Fuel Injector #2
Digital Meter (+) → BL/R lead (ECU terminal 41)
Digital Meter (–) → Battery (–) terminal
For Fuel Injector #3
Digital Meter (+) → BL/O lead (ECU terminal 40)
Digital Meter (–) → Battery (–) terminal
For Fuel Injector #4
Digital Meter (+) → BL/G lead (ECU terminal 52)
Digital Meter (–) → Battery (–) terminal

- Measure the output voltage with the engine stopped and with the connector joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch to ON.

Output Voltage
Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch to OFF.

★If the reading is not the standard, check the ECU main relay and fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
★If the main relay and pump relay are normal, check the wiring (see Fuel Injector Circuit).
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If there is still no battery voltage, check the fuel injector resistance (see Fuel Injector Resistance Inspection) and wiring (see Fuel Injector Circuit).

Fuel Injectors

Fuel Injector Fuel Line Inspection

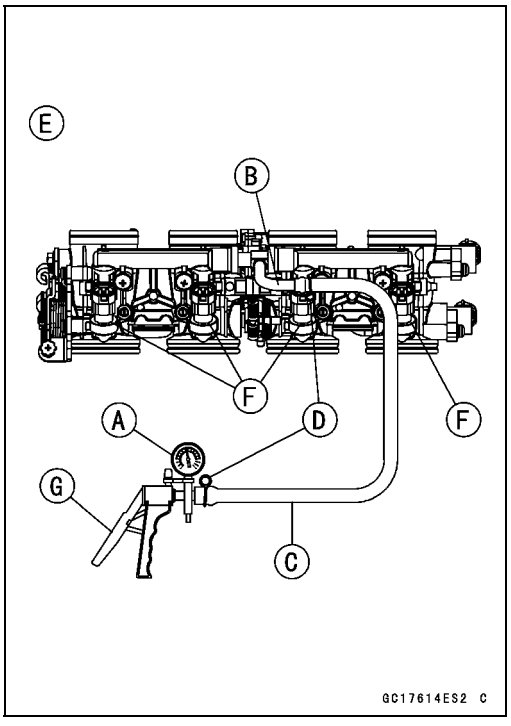
● Remove:
Fuel Tank (see Fuel Tank Removal)
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.

● Check the injector fuel line for leakage as follows.
○Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamps [D]) as shown in the figure.
Lower Side View [E]
○Apply soap and water solution to the areas [F] as shown in the figure.
○Watching the pressure gauge, squeeze the pump lever [G], and build up the pressure until the pressure reaches the maximum pressure.

Injector Fuel Line Maximum Pressure
Standard: 300 kPa (3.06 kgf/cm², 43 psi)



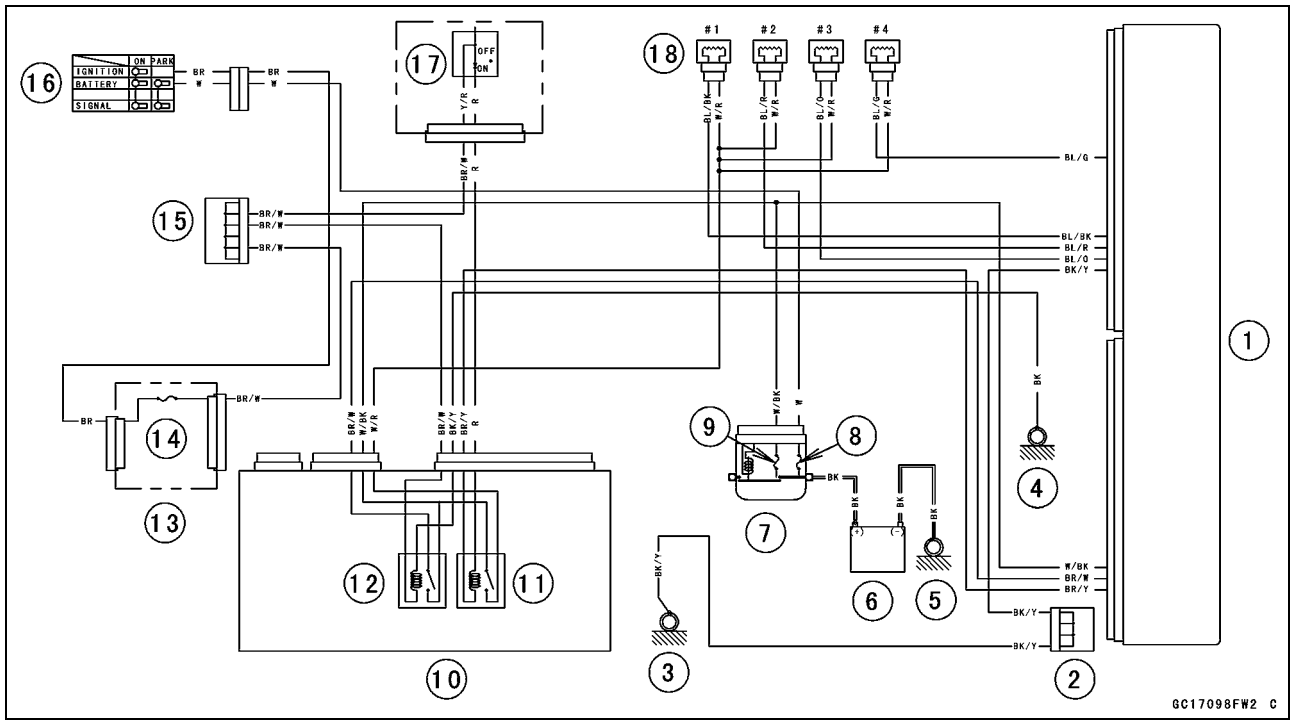
NOTICE

During pressure testing, do not exceed the maximum pressure for which the system is designed.

○Watch the gauge for at least 6 seconds.
★If the pressure holds steady, the fuel line is good.
★If the pressure drops at once or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, injectors and related parts.
○Repeat the leak test, and check the fuel line for no leakage.
● Install:
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Fuel Tank (see Fuel Tank Installation)
● Confirm that the drain hose and clamp are installed securely and run the hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
● Start the engine and check for fuel leakage.

Fuel Injectors

Fuel Injector Circuit



1. ECU
2. Joint Connector D
3. Frame Ground 2
4. Frame Ground 3
5. Engine Ground
6. Battery 12 V 8 Ah
7. Starter Relay
8. Main Fuse 30 A
9. ECU Fuse 15 A
10. Relay Box
11. Fuel Pump Relay
12. ECU Main Relay
13. Fuse Box 1
14. Ignition Fuse 15 A
15. Joint Connector F
16. Ignition Switch
17. Engine Stop Switch
18. Fuel Injectors

Throttle Grip and Cables

Free Play Inspection

- Refer to the Throttle Control System Inspection in the Periodic Maintenance chapter.

Free Play Adjustment

- Refer to the Throttle Control System Inspection in the Periodic Maintenance chapter.

Cable Installation

- Install the throttle cables in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the lower ends of the throttle cables in the throttle pulley on the throttle body assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly (see Throttle Control System Inspection in the Periodic Maintenance chapter).

⚠ WARNING

Operation with incorrectly routed or improperly adjusted cables could result in an unsafe riding condition. Be sure the cables are routed correctly and properly adjusted.

Cable Lubrication

- Refer to the Chassis Parts Lubrication in the Periodic Maintenance chapter.

Throttle Body Assy

Idle Speed Inspection/Adjustment

● Refer to the Idle Speed Inspection/Adjustment in the Periodic Maintenance chapter.

Synchronization Inspection/Adjustment

● Refer to the Engine Vacuum Synchronization Inspection in the Periodic Maintenance chapter.

Throttle Body Assy Removal

⚠ WARNING

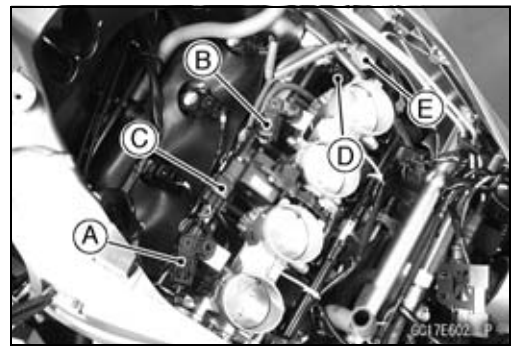
Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch to OFF. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

NOTICE

Never drop the throttle body assy especially on a hard surface. Such a shock to the body assy can damage it.

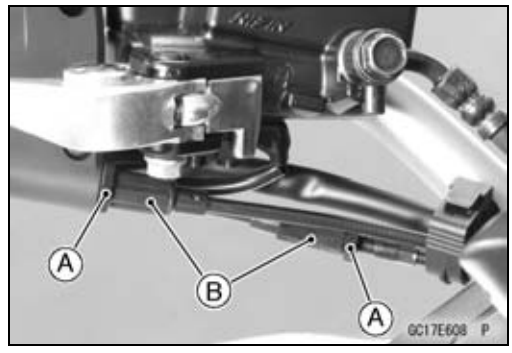
● Remove:
Side Cover (see Side Cover Removal in the Frame chapter)
Air Cleaner Housing (see Air Cleaner Housing Removal)
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
● Clear the adjusting screw [A] from the bracket.

● Disconnect:
Intake Air Pressure Sensor #1 Connector [A]
Intake Air Pressure Sensor #2 Connector [B]
Subthrottle Valve Actuator Connector [C]
Main Throttle Sensor Connector [D]
Subthrottle Sensor Connector [E]

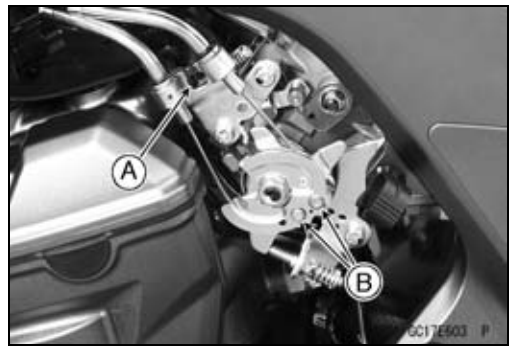


Throttle Body Assy

- Loosen the locknuts [A].
- Turn the adjusters [B] to give the more free play.

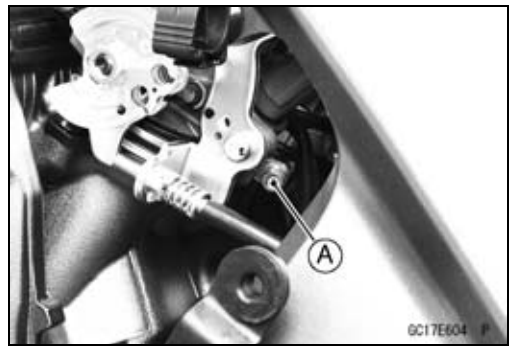


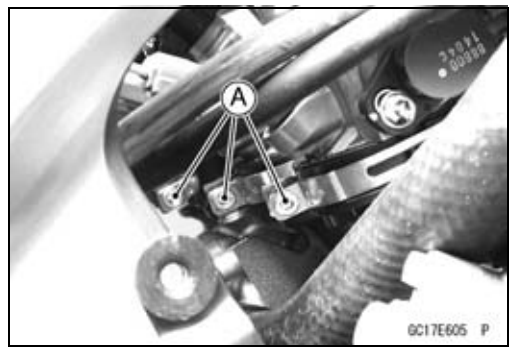
- Remove:
  Throttle Cable Holder Clamp [A]
  Throttle Cable Lower Ends [B]



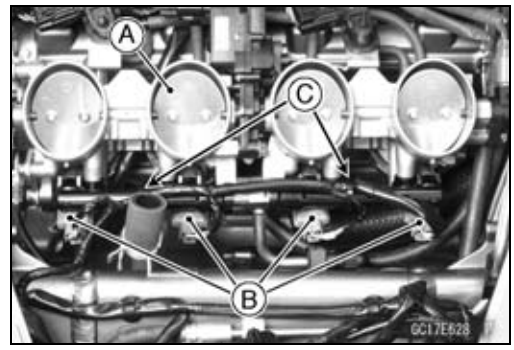
- Loosen the throttle body assy holder clamp bolts [A].

Special Tool - Carburetor Drain Plug Wrench, Hex 3: 57001-1269





Throttle Body Assy



- Remove the throttle body assy [A] from the throttle body assy holders.
- Disconnect the injector connectors [B].
- Remove the clamps [C].
- After removing the throttle body assy, stuff pieces of lint -free, clean cloth into the throttle body assy holders.

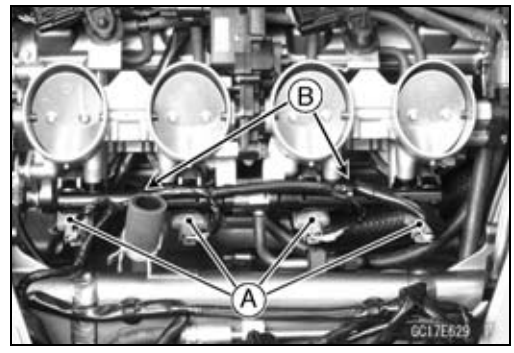
⚠ WARNING

If dirt or dust is allowed to pass through into the throttle body assy, the throttle may become stuck, possibly causing accident.

NOTICE

If dirt gets into the engine, excessive engine wear and possible engine damage will occur.

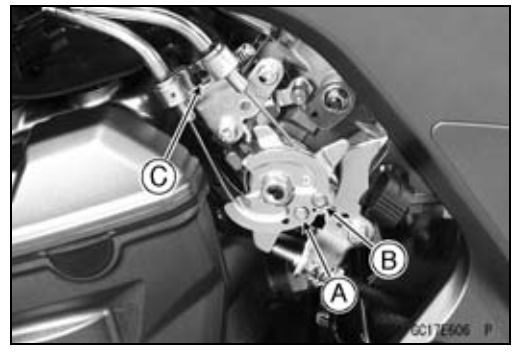
Throttle Body Assy Installation



- Be sure to position the throttle body assy holder clamp in original position (see Throttle Body Assy Holder Installation in the Engine Top End chapter).
- Connect the injector connectors [A].
- Install the throttle body assy to the throttle body assy holders.
- Install the clamps [B].
- Tighten:

Torque - Throttle Body Assy Holder Clamp Bolts: 2.9 N·m (0.30 kgf·m, 26 in·lb)

Special Tool - Carburetor Drain Plug Wrench, Hex 3: 57001-1269



- Apply a thin coat of grease to the throttle cable lower ends.
- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley.

○The accelerator cable has a clamp [C].

- Install the clamp securely.

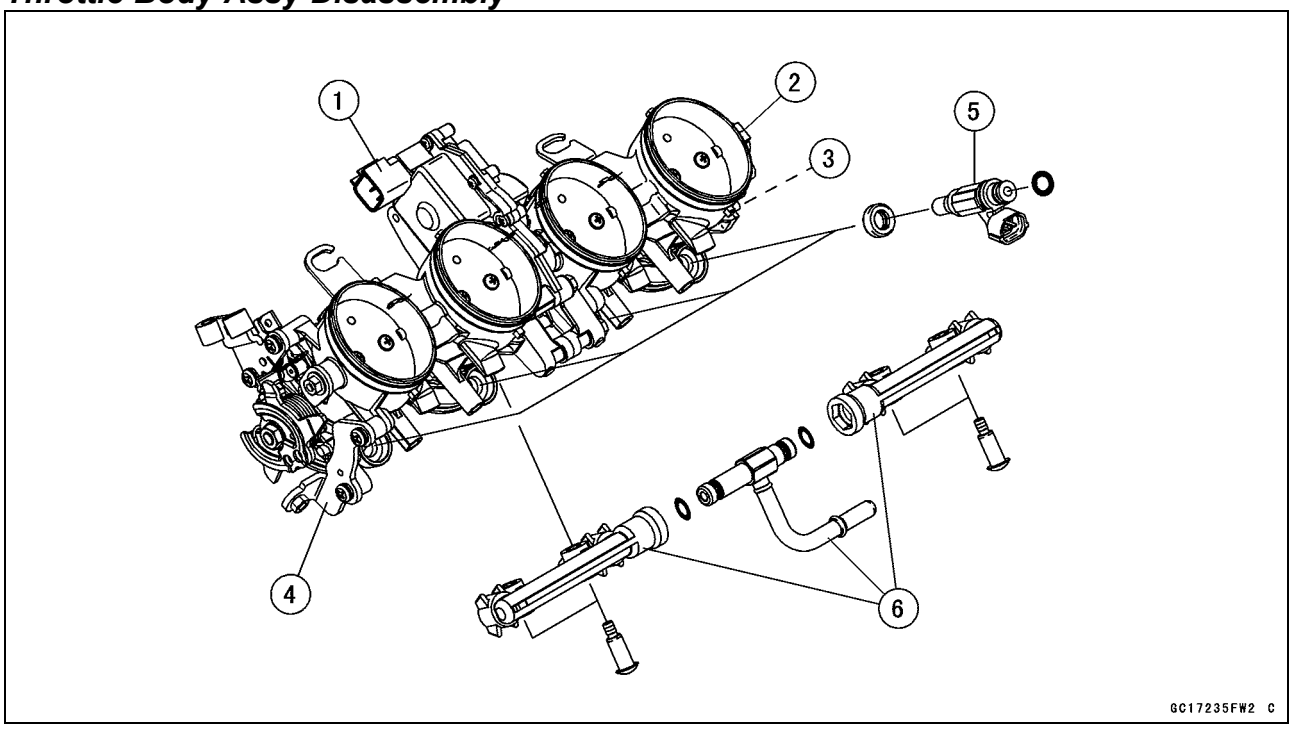
- Turn the throttle grip and make sure that the throttle pulley moves smoothly and return by spring force.
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust:

  Throttle Grip Free Play (see Throttle Control System Inspection in the Periodic Maintenance chapter)

  Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)

Throttle Body Assy

Throttle Body Assy Disassembly



1. Subthrottle Valve Actuator
2. Subthrottle Sensor
3. Main Throttle Sensor
4. Throttle Body Assy
5. Fuel Injectors
6. Delivery Pipe Assy

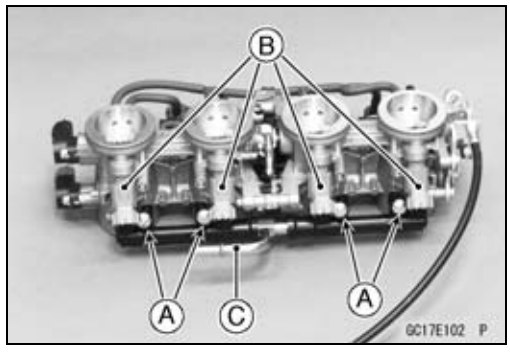
NOTICE

Do not remove, disassemble or adjust the main throttle sensor, subthrottle sensor, subthrottle valve actuator, throttle link mechanism and throttle body assy, because they are adjust or set surely at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Remove the delivery pipe assy mounting screws [A] to pull out the fuel injectors [B] from the throttle body assy together with the delivery pipe assy [C].

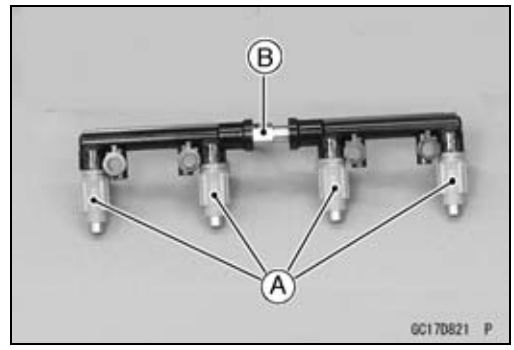
NOTE

○*Do not damage the insertion portions of the injectors when they are pulled out from the throttle body.*



Throttle Body Assy

- Pull out the fuel injectors [A] from the delivery pipe assy [B].



NOTE

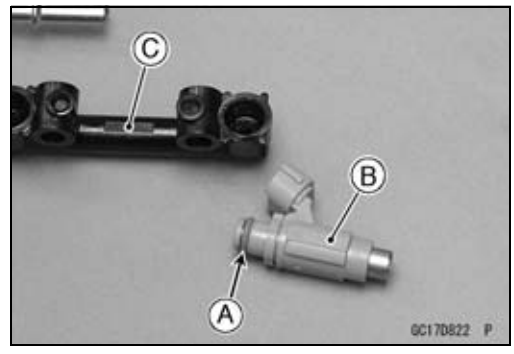
○*Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.*

NOTICE

Never drop the primary fuel injector, especially on a hard surface. Such a shock to the injector can damage it.

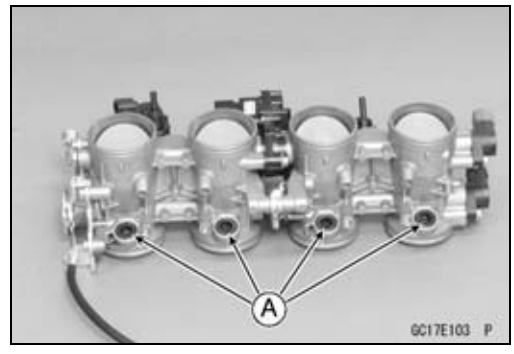
Throttle Body Assy Assembly

- Before assembling, blow away dirt or dust from the throttle body and delivery pipe assy by applying compressed air.
- Replace the O-rings [A] of each fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, insert them to the delivery pipe assy [C] and confirm whether the injectors turn smoothly or not.



- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the fuel injectors along with the delivery pipe assy to the throttle body.
- Tighten:

Torque - Delivery Pipe Assy Mounting Screws: 3.4 N·m (0.35 kgf·m, 30 in·lb)



- Install the throttle body assy (see Throttle Body Assy Installation).

Air Cleaner

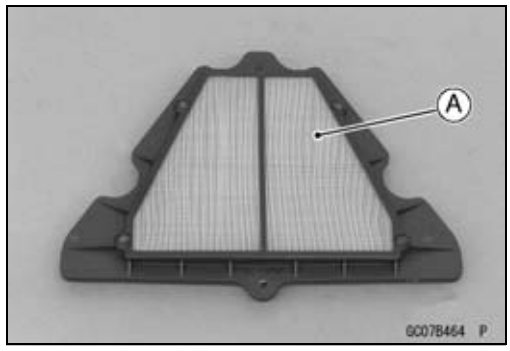
Air Cleaner Element Removal/Installation

- Refer to the Air Cleaner Element Replacement in the Periodic Maintenance chapter.

Air Cleaner Element Inspection

- Remove the air cleaner element (see Air Cleaner Element Replacement in the Periodic Maintenance chapter).
- Visually check the element [A] for tears or breaks.

★If the element has any tears or breaks, replace the element.



Air Cleaner Oil Draining

A drain hose is connected to the bottom of the air cleaner to drain water or oil accumulated in the cleaner part.

- Visually check the catch tank [A] of the drain hose, if the water or oil accumulates in the tank.

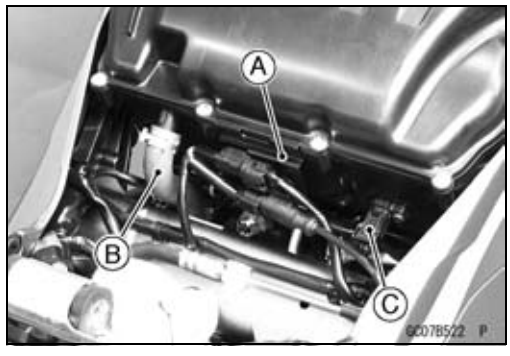
★If any water or oil accumulates in the catch tank, remove the catch tank from the drain hose and drain it.

⚠ WARNING

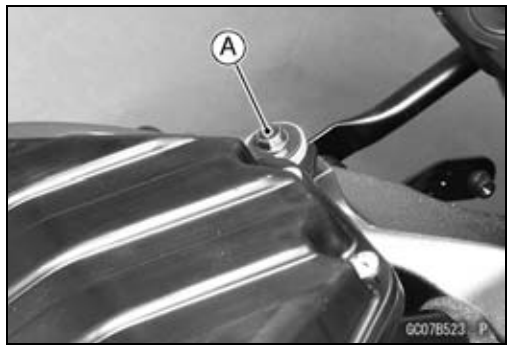
Oil on tires will make them slippery and can cause an accident and injury. Be sure to reinstall the catch tank after draining.

Air Cleaner Housing Removal

- Remove:
  Fuel Tank (see Fuel Tank Removal)
  Connector Bracket [A]
  Breather Hose [B] and Clamp
- Disconnect the intake air temperature sensor connector [C].

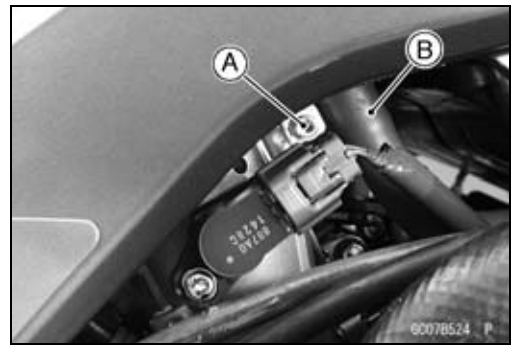


- Remove the bolt [A].



Air Cleaner

- Loosen the air cleaner duct clamp bolt [A] (both sides).
- Lift up the air cleaner housing, and remove the air switching valve hose [B].
- After removing the air cleaner housing, cover the clean cloth on the throttle body assy.



⚠ WARNING

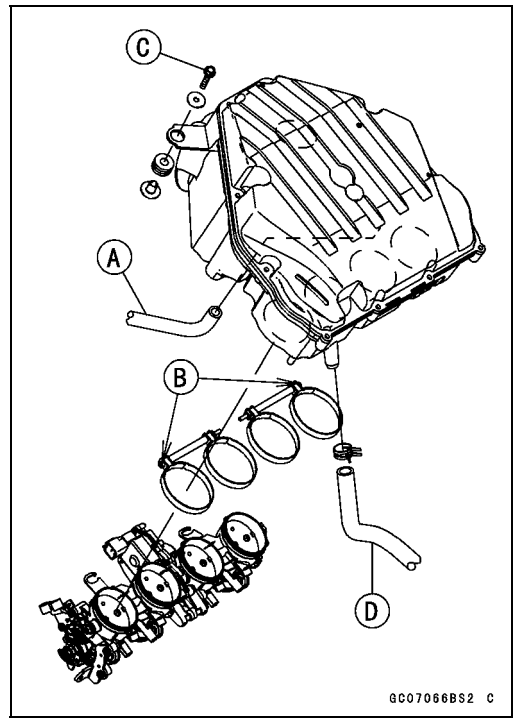
If dirt or dust is allowed to pass through into the throttle body assy, the throttle may become stuck, possibly causing accident.

Air Cleaner Housing Installation

- Install the air switching valve hose [A] to the air cleaner housing.
- Install the air cleaner housing on the throttle body assy.
- ○Install the clamp bolt heads [B] outside as shown in the figure.
- Tighten:

Torque - Air Cleaner Duct Clamp Bolts: 2.0 N·m (0.20 kgf·m, 18 in·lb)

- Tighten the air cleaner housing mounting bolts [C].
- Install the breather hose [D] and clamp.
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



Fuel Tank

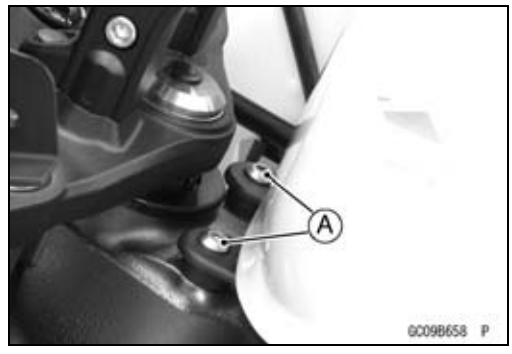
Fuel Tank Removal

⚠ WARNING

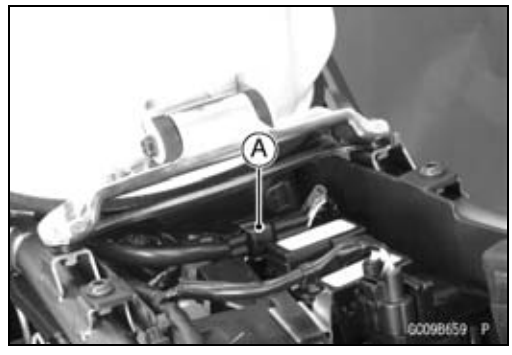
Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch to OFF. Disconnect the battery (–) terminal. To avoid fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

- Turn the ignition switch to OFF.
- Wait until the engine cools down.
- Disconnect the battery (–) terminal (see Battery Removal in the Electrical System chapter).

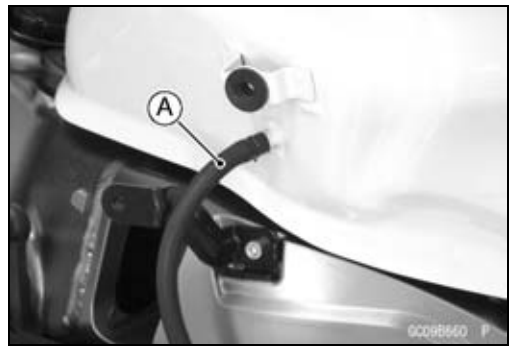
- Remove:
  Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  Meter Cover (see Meter Cover Removal in the Frame chapter)
  Seat (see Seat Removal in the Frame chapter)
  Front Fuel Tank Bolts [A]



- Disconnect the fuel pump lead connector [A].



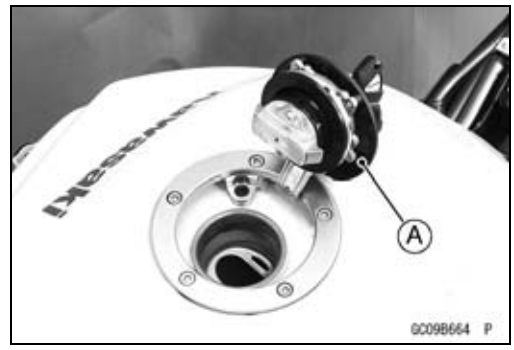
- Remove the breather hose [A] and clamp.



Fuel Tank

- Open the fuel tank cap [A] to lower the pressure in the tank.

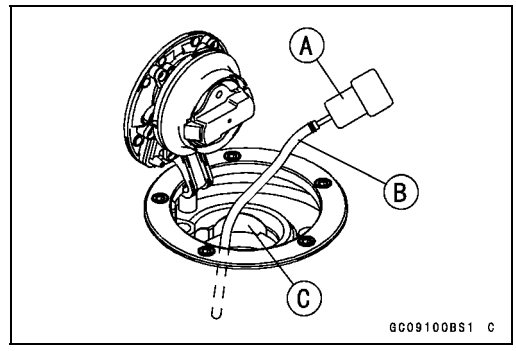
○During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.



- Draw the fuel out from the fuel tank with a commercially available pump [A].

○Use a soft plastic hose [B] as a pump inlet hose in order to insert the hose smoothly.

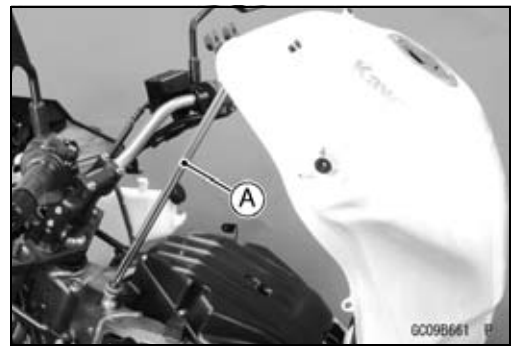
○Put the hose through the fill opening [C] into the tank and draw the fuel out.



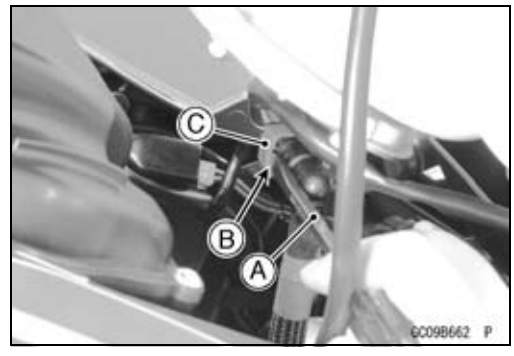
⚠ WARNING

Spilled fuel is flammable and can be explosive under certain conditions. The fuel can not be removed completely from the fuel tank. Be careful for remained fuel spillage.

- Remove the both side cover (see Side Cover Removal in the Frame chapter).
- Lift up the fuel tank, and support it with a suitable bar [A].

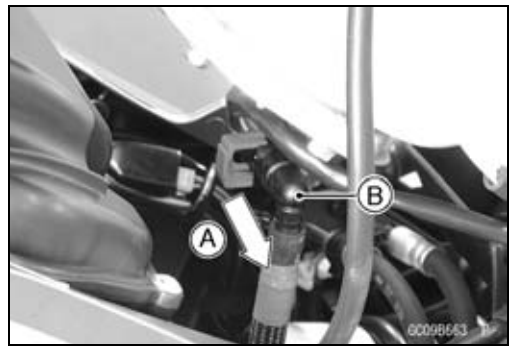


- Be sure to place a piece of cloth around the fuel hose joint.
- Insert a thin blade screwdriver [A] into the slit [B] on the joint lock [C].
- Pry the screwdriver to disconnect the joint lock.



Fuel Tank

● Pull [A] the fuel hose joint [B] out of the outlet pipe.

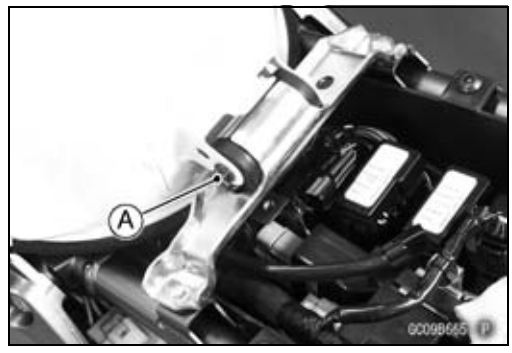


⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.

● Close the fuel tank cap.

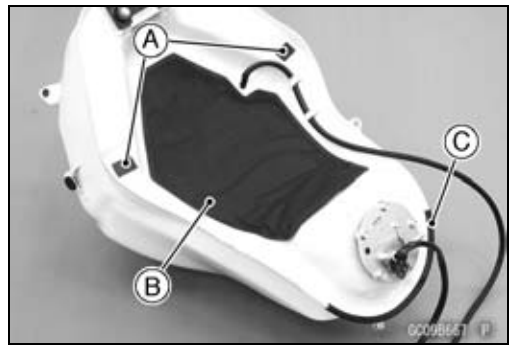
● Remove the bar which supported fuel tank.
● Remove the rear fuel tank bolt [A].



● Remove the fuel tank, and place it on a flat surface.
○Do not apply the load to the fuel pipe of the fuel pump.

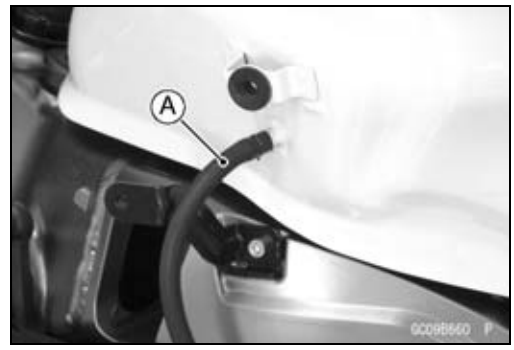
Fuel Tank Installation

● Note the above WARNING (see Fuel Tank Removal).
● Check that the dampers [A], pad [B] and trim [C] are in place on the frame and the fuel tank.
★If the dampers, pad or trims are damaged or deteriorated, replace them.

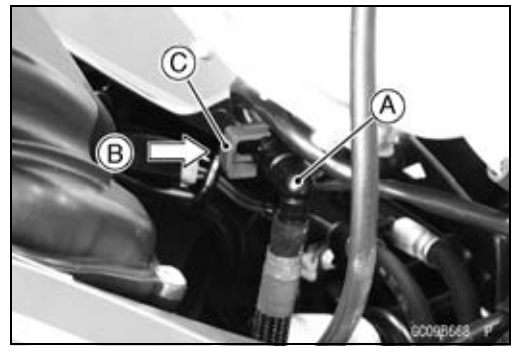


Fuel Tank

● Install the breather hose [A] and clamp securely.



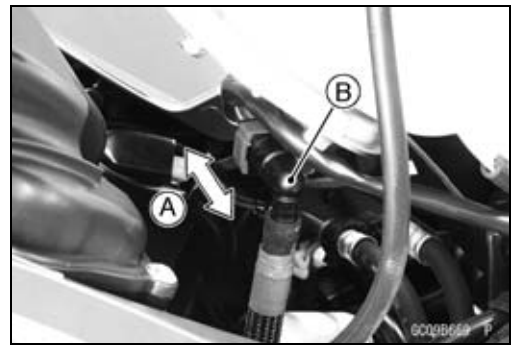
● Insert the fuel hose joint [A] straight onto the fuel outlet pipe until the hose joint clicks.
● Push [B] the joint lock [C] until the hose joint clicks.



● Push and pull [A] the hose joint [B] back and forth more than two times, and make sure it is locked and does not come off.

⚠ WARNING

Make sure the hose joint is installed correctly on the delivery pipe or the fuel could leak.

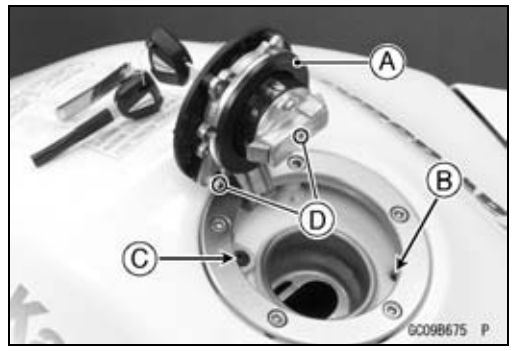


★If it comes off, reinstall the hose joint.
● Connect the fuel pump lead connector and the battery (–) terminal (see Battery Installation in the Electrical System chapter).

○Be careful not to pinch the leads, cables or harnesses around rear part of the fuel tank [A].
● Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Fuel Tank

Fuel Tank and Cap Inspection



- Open the tank cap.
- Visually inspect the gasket [A] on the tank cap for any damage.

★Replace the tank cap if gasket is damaged.

- Check to see if the water drain pipe [B] and fuel breather pipe [C] in the tank are not clogged. Check the tank cap breather also.

★If they are clogged, remove the tank and drain it, and then blow the breather free with compressed air.

NOTICE

Do not apply compressed air to the air vent holes [D] in the tank cap. This could cause damage and clogging of the labyrinth in the cap.

Fuel Tank Cleaning

⚠ WARNING

Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the tank in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area. Do not use gasoline or low-flash point solvents to clean the tank.

- Remove:
  Fuel Tank (see Fuel Tank Removal)
  Fuel Pump (see Fuel Pump Removal)
- Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Draw the solvent out of the fuel tank.
- Dry the tank with compressed air.
- Install:
  Fuel Pump (see Fuel Pump Installation)
  Fuel Tank (see Fuel Tank Installation)

Cooling System

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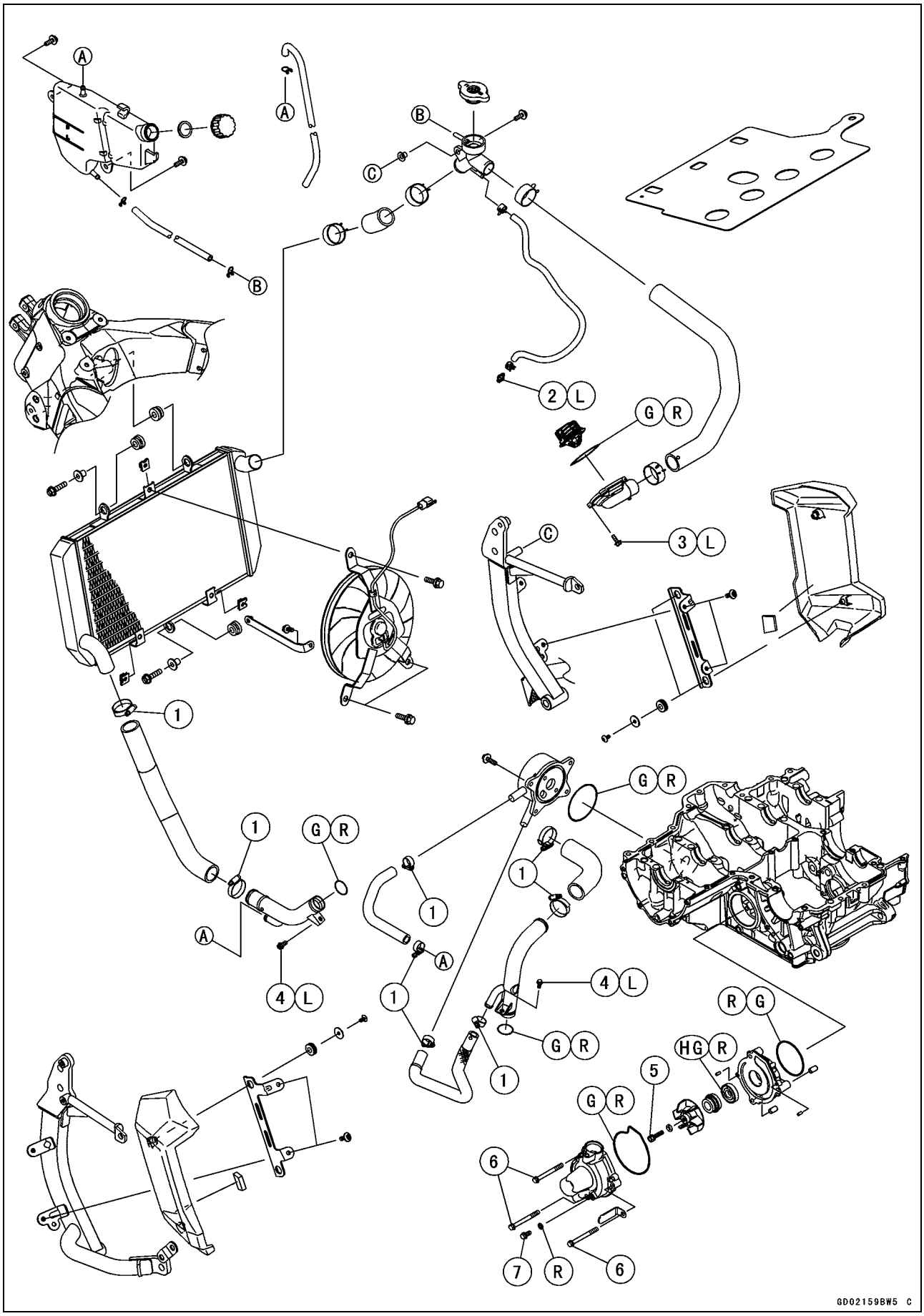
Exploded View

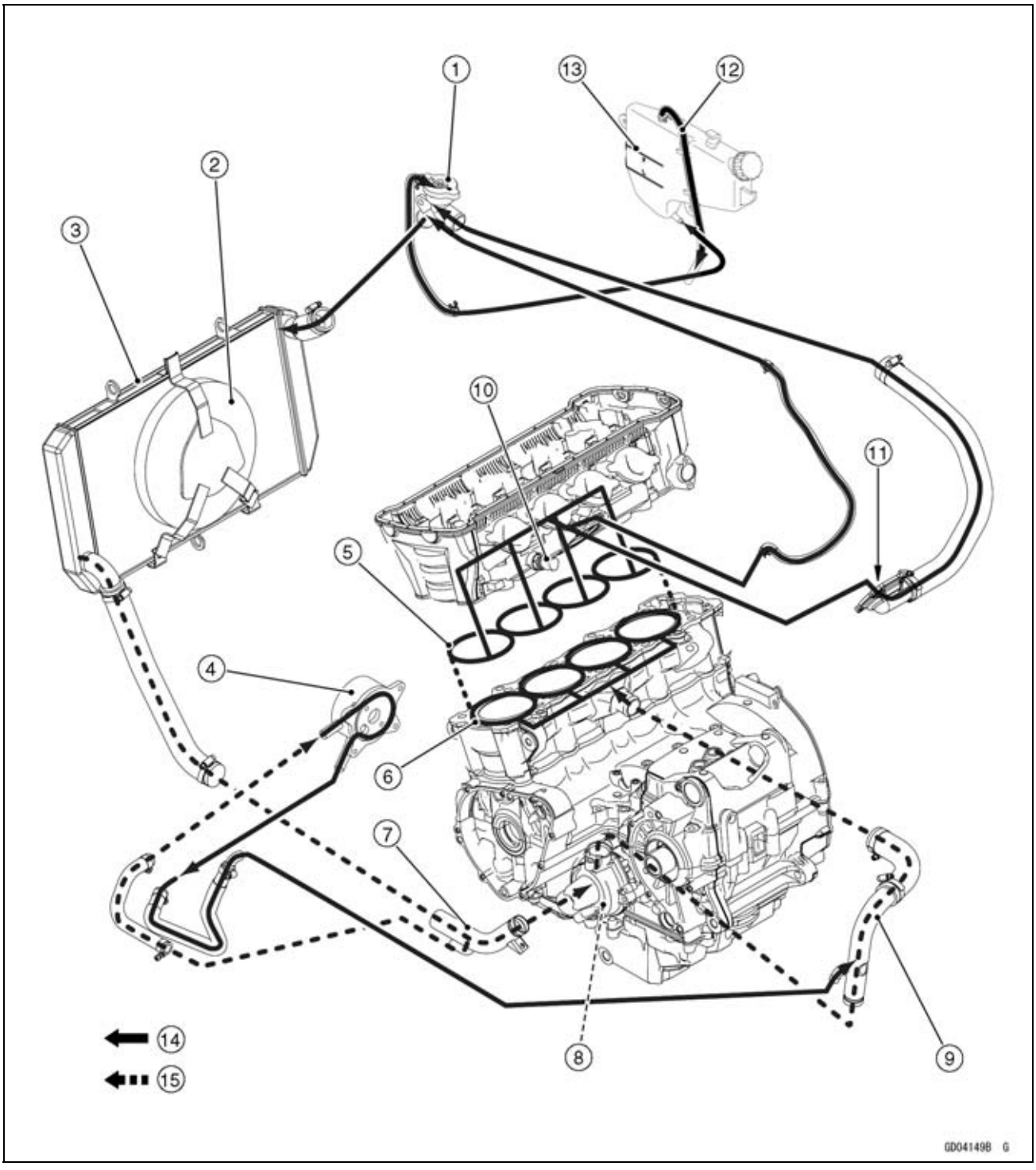


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Radiator (Water) Hose Clamp Screws	2.9	0.30	26 in·lb	
2	Coolant By-pass Fitting Bolt	8.8	0.90	78 in·lb	L
3	Thermostat Housing Bolts	5.9	0.60	52 in·lb	L
4	Water Pipe Bolts	12	1.2	106 in·lb	L
5	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
6	Water Pump Cover Bolts	11	1.1	97 in·lb	
7	Coolant Drain Bolt	11	1.1	97 in·lb	

G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

Coolant Flow Chart



1. Radiator Cap
2. Radiator Fan
3. Radiator
4. Oil Cooler
5. Cylinder Head Jacket
6. Cylinder Jacket
7. Inlet Pipe
8. Water Pump
9. Outlet Pipe
10. Water Temperature Sensor
11. Thermostat Housing
12. Reserve Tank Overflow Hose
13. Reserve Tank
14. Hot Coolant
15. Cold Coolant

Coolant Flow Chart

Permanent type antifreeze is used as a coolant to protect the cooling system from rust and corrosion. When the engine starts, the water pump turns and the coolant circulates.

The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is less than 55°C (131°F), the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 58 ~ 62°C (136 ~ 144°F), the thermostat opens and the coolant flows.

When the coolant temperature goes up beyond 100°C (212°F), the radiator fan relay conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the coolant temperature is below 97.5°C (208°F), the fan relay opens and the radiator fan stops.

In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.

The system is pressurized by the radiator cap to suppress boiling and the resultant air bubbles which can cause engine overheating. As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conversely, as the engine cools down, the coolant in the radiator and the water jacket contracts, and the stored coolant flows back to the radiator from the reserve tank.

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

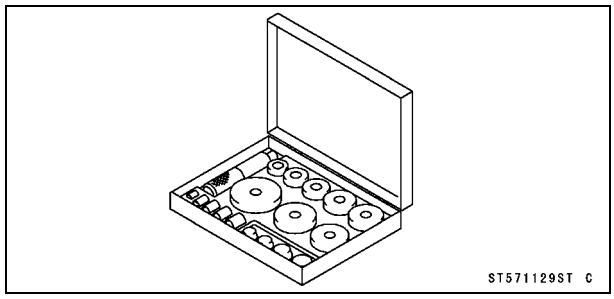
4-6 COOLING SYSTEM

Specifications

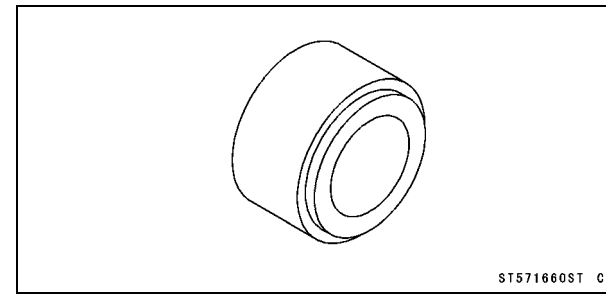
Item	Standard
Coolant Provided when Shipping	
Type (Recommended)	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Color	Green
Mixed Ratio	Soft water 50%, coolant 50%
Freezing Point	−35°C (−31°F)
Total Amount	2.6 L (2.7 US qt) (reserve tank full level, including radiator and engine)
Radiator Cap	
Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi)
Thermostat	
Valve Opening Temperature	58 ~ 62°C (136 ~ 144°F)
Valve Full Opening Lift	8 mm (0.31 in.) or more at 75°C (167°F)

Special Tools

Bearing Driver Set:
57001-1129



Oil Seal Driver ϕ37.5:
57001-1660



Coolant

Coolant Deterioration Inspection

- Remove the right middle fairing (see Middle Fairing Removal in the Frame chapter).
- Visually inspect the coolant [A] in the reserve tank.

★If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.

★If the coolant gives off an abnormal smell, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.

Coolant Level Inspection

- Refer to the Coolant Level in the Periodic Maintenance chapter.

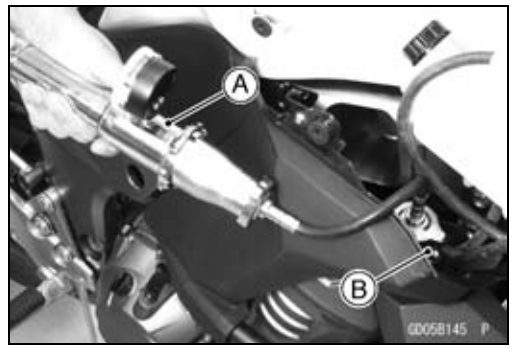
Coolant Draining

- Refer to the Coolant Change in the Periodic Maintenance chapter.

Coolant Filling

- Refer to the Coolant Change in the Periodic Maintenance chapter.

Pressure Testing



- Remove the right middle fairing (see Middle Fairing Removal in the Frame chapter).
- Remove the radiator cap, and install a cooling system pressure tester [A] on the filler neck [B].

NOTE

○*Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.*

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm², 18 psi).

NOTICE

During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm², 18 psi).

- Watch the gauge for at least 6 seconds.

★If the pressure holds steady, the system is all right.

★If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the water pump.

- Remove the pressure tester, replenish the coolant, and install the radiator cap.

Coolant

Cooling System Flushing

Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passage and considerable reduce the efficiency of the cooling system.

- Drain the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Fill the cooling system with fresh water mixed with a flushing compound.

NOTICE

Do not use a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning product.

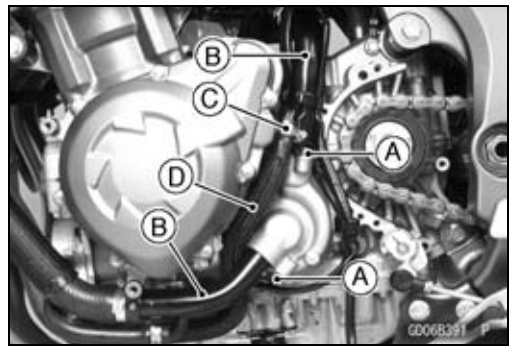
- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant and bleed the air from the system (see Coolant Change in the Periodic Maintenance chapter).

Coolant Reserve Tank Removal/Installation

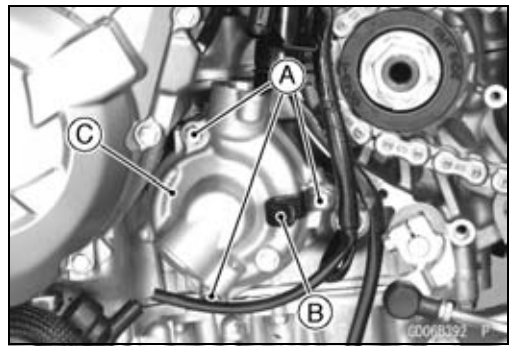
- The coolant reserve tank is removed and installed during coolant change (see Coolant Change in the Periodic Maintenance chapter).

Water Pump

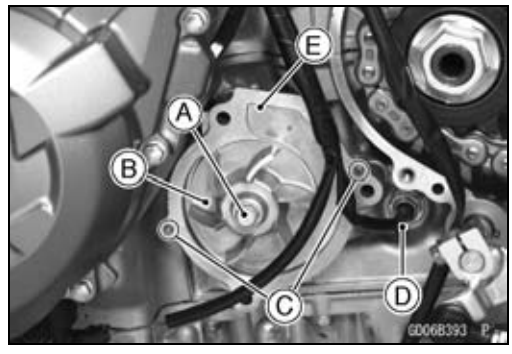
Water Pump Removal



- Drain:
  Coolant (see Coolant Change in the Periodic Maintenance chapter)
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Left Side Cover (see Side Cover Removal in the Frame chapter)
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Engine Sprocket Cover (see Engine Sprocket Cover Removal in the Final Drive chapter)
- Remove the water pipe bolts [A] to pull out the water pipes [B] from the water pump cover.
- Loosen the clamp bolt [C] to remove the water hose [D].

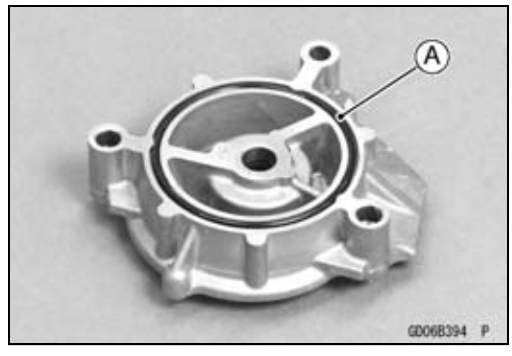


- Remove:
  Water Pump Cover Bolts [A]
  Clamp [B]
  Water Pump Cover [C]



- Remove:
  Water Pump Impeller Bolt [A] and Washer
  Water Pump Impeller [B]
  Dowel Pins [C]
- Disconnect the neutral switch connector [D].
- Remove the water pump housing [E].

Water Pump Installation



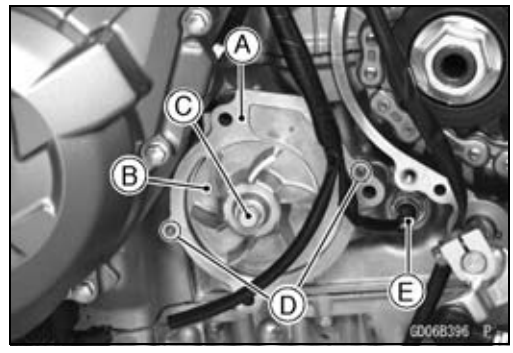
- Replace the O-ring [A] with a new one, and install it.

Water Pump

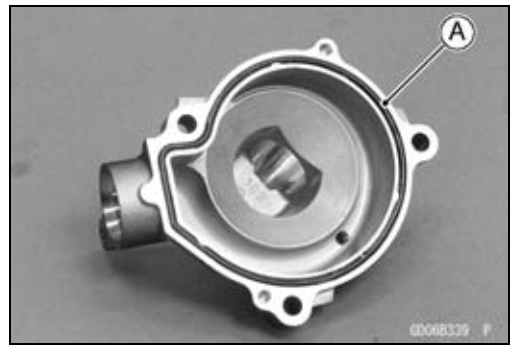
- Be sure to install the dowel pins [A].

- Install:
  Water Pump Housing [A]
  Water Pump Impeller [B]
- Tighten:

  Torque - Water Pump Impeller Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Be sure to install the dowel pins [D].
- Connect the neutral switch connector [E].

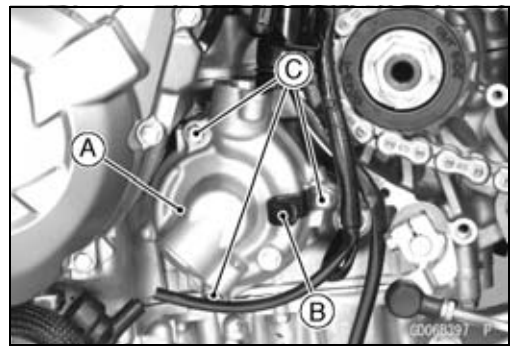


- Replace the O-ring [A] with a new one, and install it.

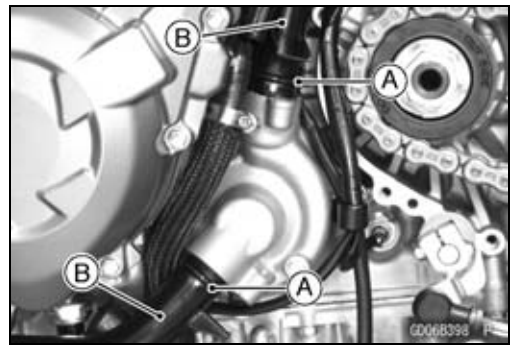


- Install the water pump cover [A] and clamp [B].
- Tighten:

  Torque - Water Pump Cover Bolts [C]: 11 N·m (1.1 kgf·m, 97 in·lb)



- Install the new O-rings [A] on the water pipe [B].
- Insert the water pipes into the water pump cover.



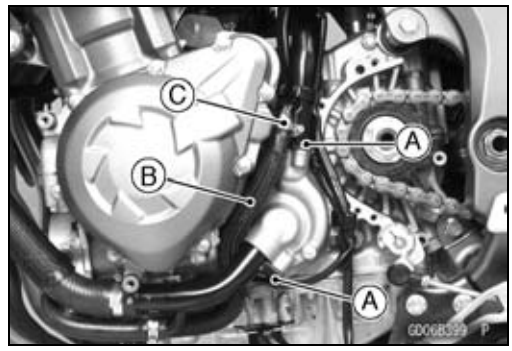
Water Pump

- Apply a non-parmanent locking agent to the threads of the water pipe bolts [A], and tighten them.

  Torque - Water Pipe Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Connect the water hose [B] to the upper water pipe.
- Tighten:

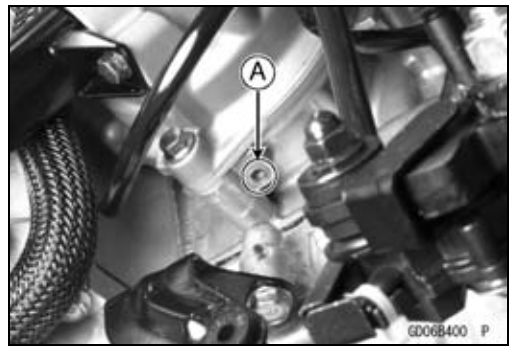
  Torque - Water Hose Clamp Screw [C]: 2.9 N·m (0.30 kgf·m, 26 in·lb)



Water Pump Inspection

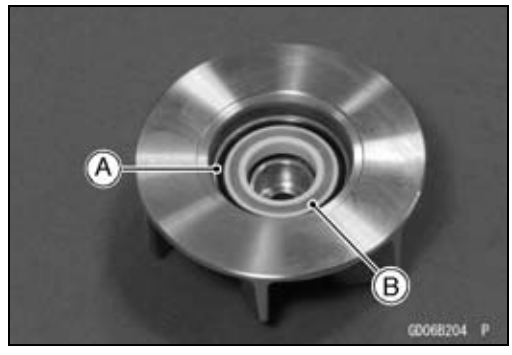
- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Check the drainage outlet passage [A] at the bottom of the water pump body for coolant leaks.

★If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal unit.



Water Pump Impeller Disassembly/Assembly

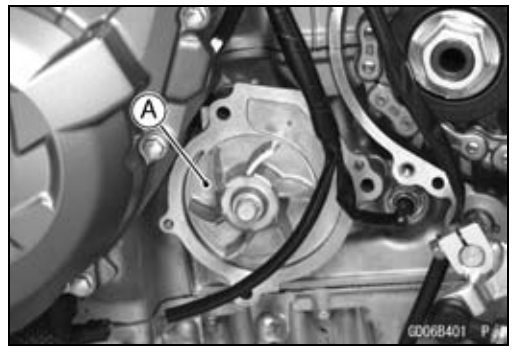
- Remove the water pump impeller (see Water Pump Removal).
- The sealing seat and rubber seal may be removed easily by hand.
- Apply coolant around the surfaces of the rubber seal and sealing seat.
- Install the rubber seal [A] and sealing seat [B] into the impeller by pressing them by hand until the seat stops at the bottom of the hole.
- Install the water pump impeller (see Water Pump Installation).



Water Pump Impeller Inspection

- Remove the water pump cover (see Water Pump Removal).
- Visually inspect the water pump impeller [A].

★If the surface is corroded or if the blades are damaged, replace the impeller.



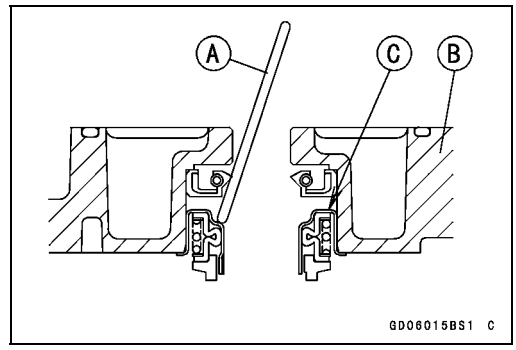
Water Pump

Water Pump Housing Disassembly

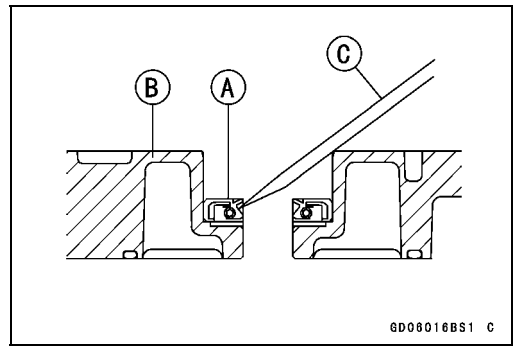
NOTICE

Do not damage the hole wall of the water pump housing.

- Insert a bar [A] into the pump housing [B], and hammer evenly around the circumference of the mechanical seal bottom [C].



- Take the oil seal [A] out of the housing [B] with a hook [C].



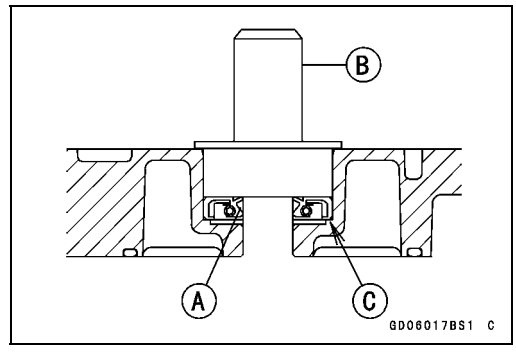
Water Pump Housing Assembly

NOTICE

Do not reuse the mechanical seal and oil seal.

- Apply high-temperature grease to the oil seal lips [A].
- Press the new oil seal into the housing with a bearing driver [B] until it stops at the bottom surface [C] of the housing.

Special Tool - Bearing Driver Set: 57001-1129

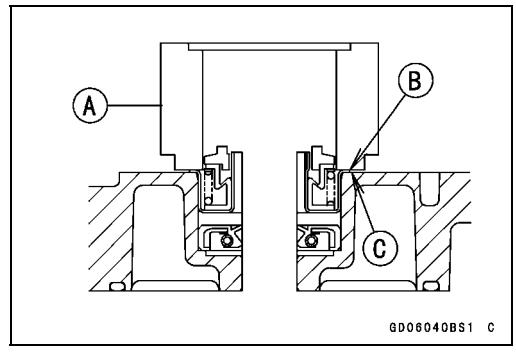


NOTICE

Be careful not to damage the sealing surface of the mechanical seal.

- Press the new mechanical seal into the housing with the oil seal driver [A] until its flange [B] touches the surface [C] of the housing.

Special Tool - Oil Seal Driverϕ37.5: 57001-1660

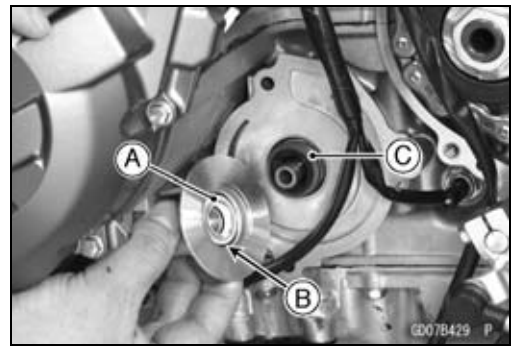


Mechanical Seal Inspection

- Remove the water pump impeller (see Water Pump Removal).
- Visually inspect the mechanical seal.

★If any one of the parts is damaged, replace the mechanical seal as a unit.

Impeller Sealing Seat Surface [A]
Rubber Seal [B]
Mechanical Seal [C]

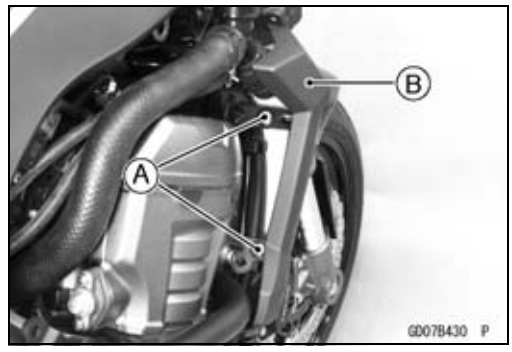


Radiator

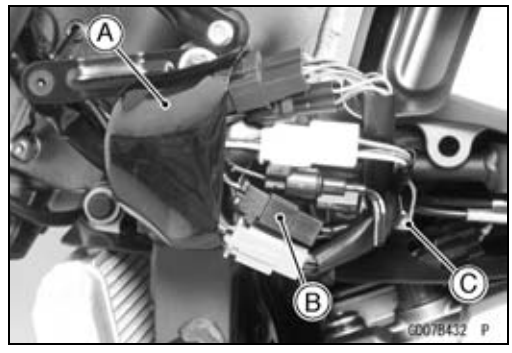
Radiator and Radiator Fan Removal

- Remove the middle fairing (see Middle Fairing Removal in the Frame chapter).
- Remove the side cover (see Side Cover Removal in the Frame chapter).
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).

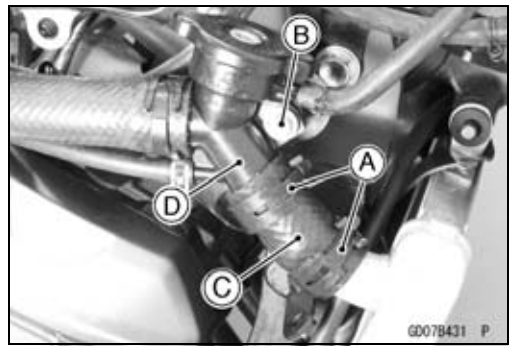
- Remove the bolts [A] and right and left radiator side covers [B].



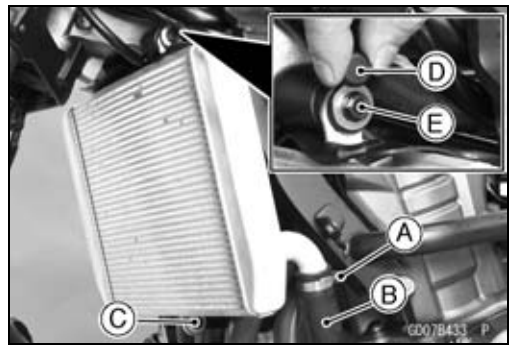
- Slide the connector cover [A] and disconnect the radiator fan motor lead connector [B].
- Release the fan motor lead from the clamp [C].



- Loosen the clamps [A] to move them forward.
- Remove the bolt [B] and collar.
- Disconnect the radiator hose [C] from the filler neck [D].

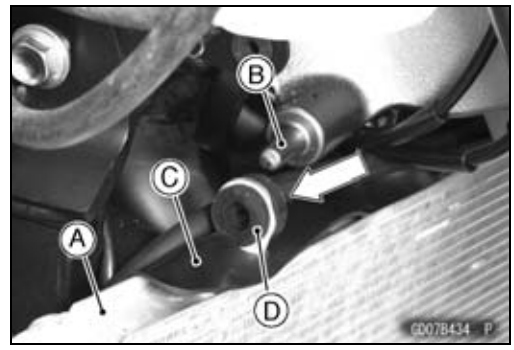


- Loosen the radiator hose clamp screw [A] and disconnect the lower radiator hose [B] from the radiator.
- Remove the radiator lower bolt [C].
- Remove the cap [D] and radiator upper bolt [D].



Radiator

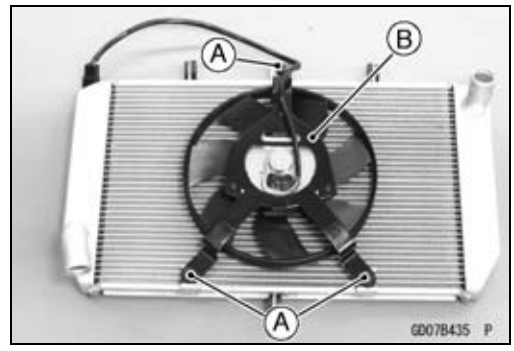
- Move the radiator [A] rightward to clear it from the frame projection [B].
- Clear the heat insulation rubber plate [C] from the radiator upper mounting brackets [D] and fan motor bracket.
- Remove the radiator from the frame.



NOTICE

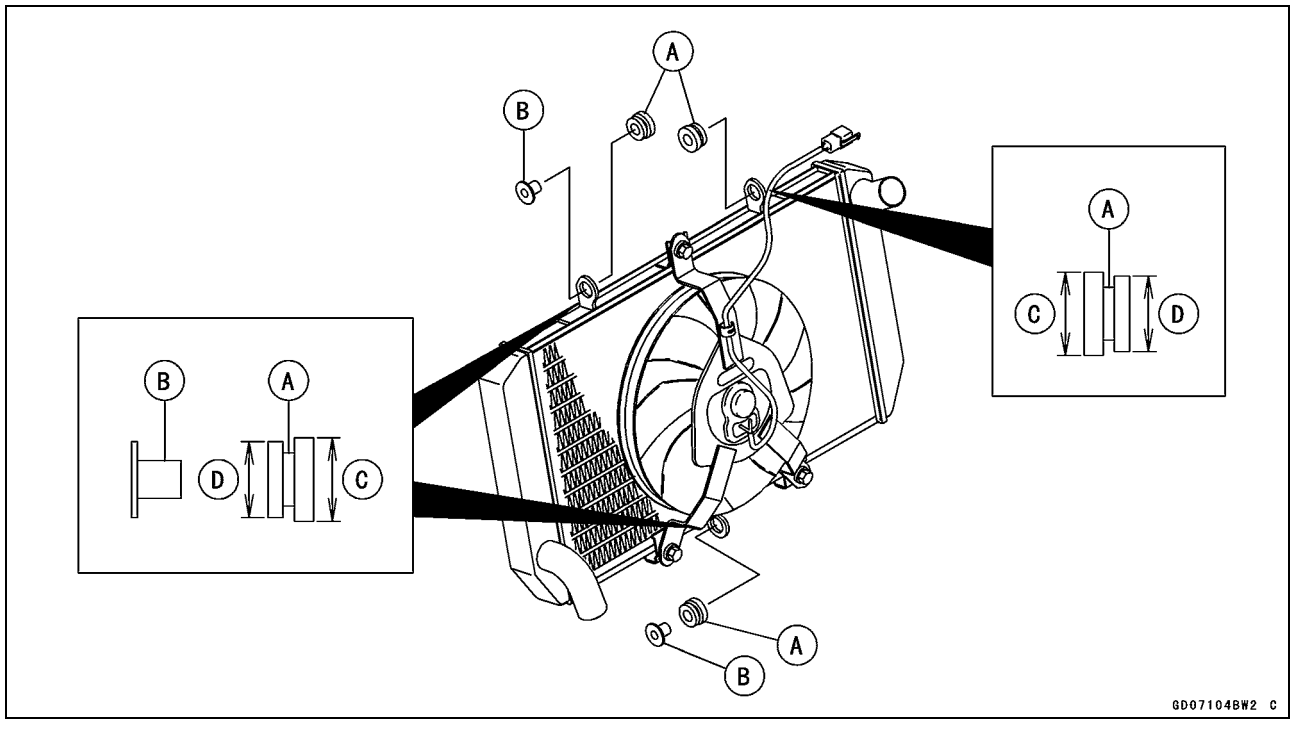
Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.

- Remove:
  Radiator Fan Mounting Bolts [A]
  Radiator Fan [B]



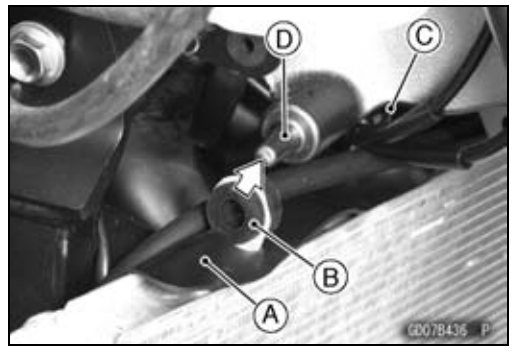
Radiator and Radiator Fan Installation

- Installation is the reverse of removal.
- Install the rubber dampers [A] and radiator bracket collars [B] as shown in the figure.
  [C] Larger
  [D] Smaller

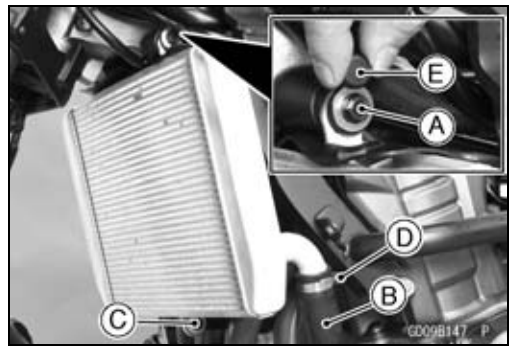


Radiator

- Fit the slits on the heat insulation rubber plate [A] to the upper mounting brackets [B] and fan motor bracket [C].
- Insert the upper right mounting bracket to the frame projection [D].
- Make sure the throttle and clutch cables are routed correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



- Install the radiator upper bolt [A].
- Connect the lower radiator hose [B].
- Install the radiator lower bolt [C] and tighten the radiator upper and lower bolts securely.
- Tighten the lower radiator hose clamp screw [D].
- Install the cap [E] on the radiator upper bolt.
- Connect the radiator fan motor lead connector.
- Install the removed parts (see appropriate chapter).



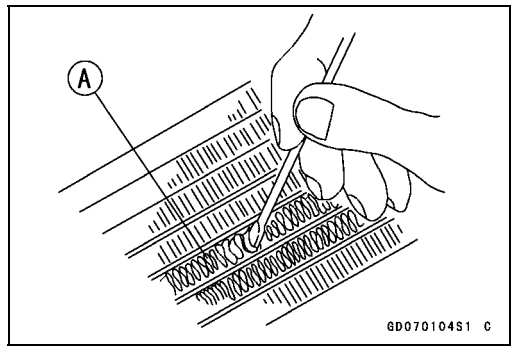
Radiator Inspection

- Check the radiator core.

★If there are obstructions to air flow, remove them.

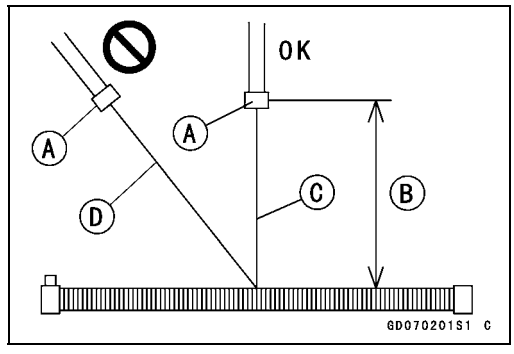
★If the corrugated fins [A] are deformed, carefully straighten them.

★If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.



NOTICE

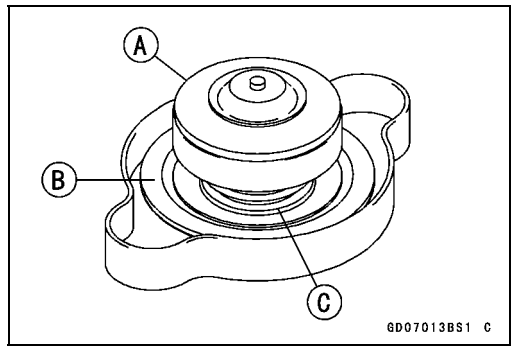
When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage:
Keep the steam gun [A] away more than 0.5 m (1.6 ft) [B] from the radiator core.
Hold the steam gun perpendicular [C] (not oblique [D]) to the core surface.
Run the steam gun, following the core fin direction.



Radiator Cap Inspection

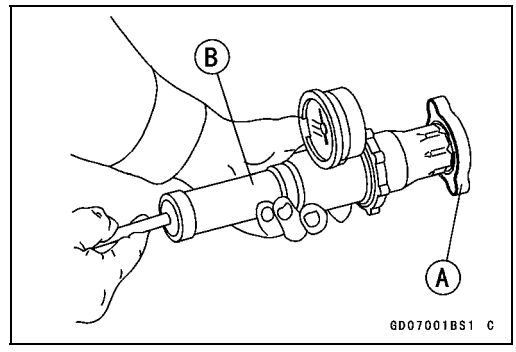
- Remove:
  Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  Radiator Cap
- Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].

★If any one of them shows visible damage, replace the cap with a new one.



Radiator

- Install the cap [A] on a cooling system pressure tester [B].



NOTE

○*Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.*

- Watching the pressure gauge, pump the pressure tester to build up the pressure until the relief valve opens: the gauge needle flicks downward. Stop pumping and measure leak time at once. The relief valve must open within the specified range in the table below and the gauge hand must remain within the same range at least 6 seconds.

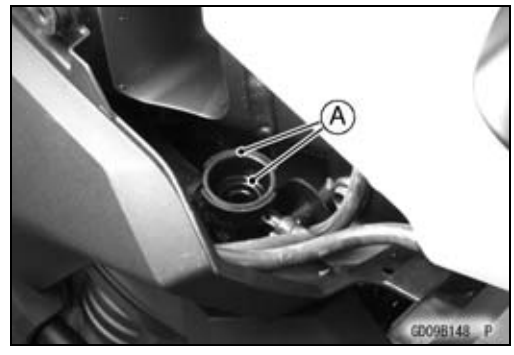
Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi)

★If the cap can not hold the specified pressure or if it holds too much pressure, replace it with a new one.

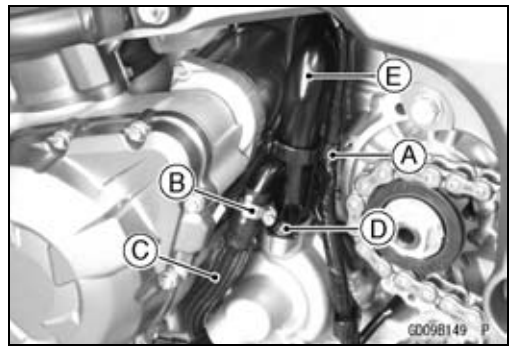
Radiator Filler Neck Inspection

- Remove:
  Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  Radiator Cap
- Check the radiator filler neck [A] for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.

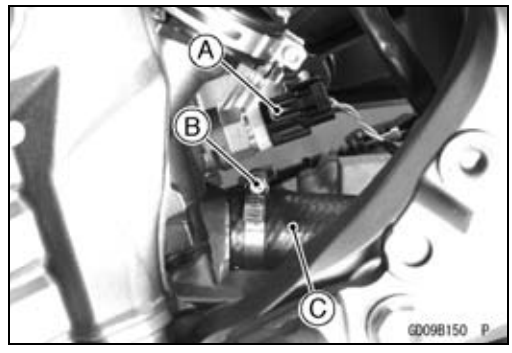


Thermostat

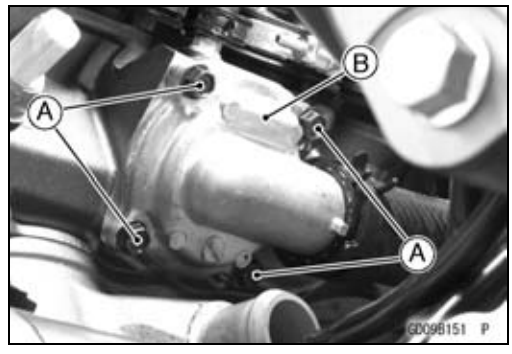
Thermostat Removal



- Remove:
  Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  Harness Holder [A]
  Water Hose Clamp [B]
  Water Hose [C]
  Water Pipe Bolts [D]
  Water Pipe [E]

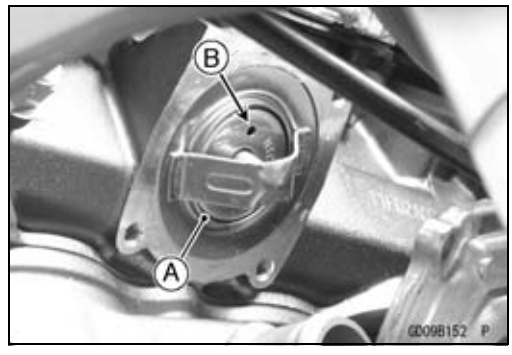


- Disconnect the connector [A] from the water temperature sensor.
- Loosen the water hose clamp screw [B] and disconnect the water hose [C] from the cylinder.



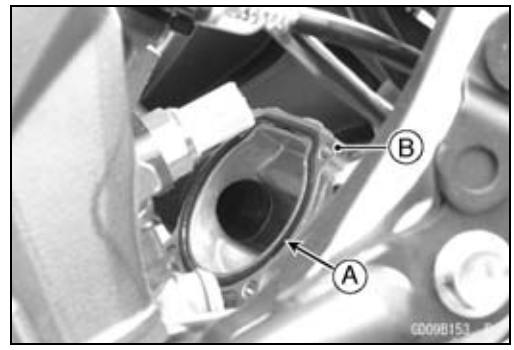
- Remove:
  Thermostat Housing Bolts [A]
  Thermostat Housing Cover [B]
  Thermostat

Thermostat Installation



- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.

Thermostat



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring, and install it.
- Install the thermostat housing cover [B].

NOTE

○*Note that the thermostat does not move at the place when installing the thermostat housing cover.*

- Apply a non-parmanent locking agent to the threads of the thermostat housing bolts.
- Tighten:

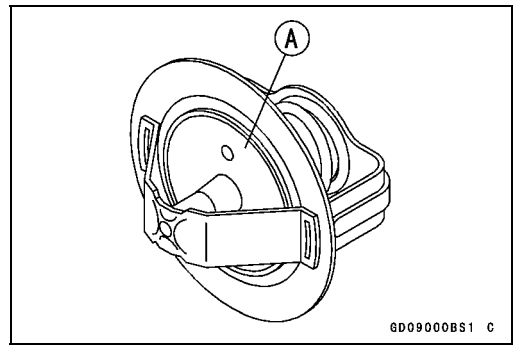
Torque - Thermostat Housing Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)

- Apply a non-parmanent locking agent to the threads of the water pipe bolt.
- Tighten:

Torque - Water Pipe Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)
Radiator (Water) Hose Clamp Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)

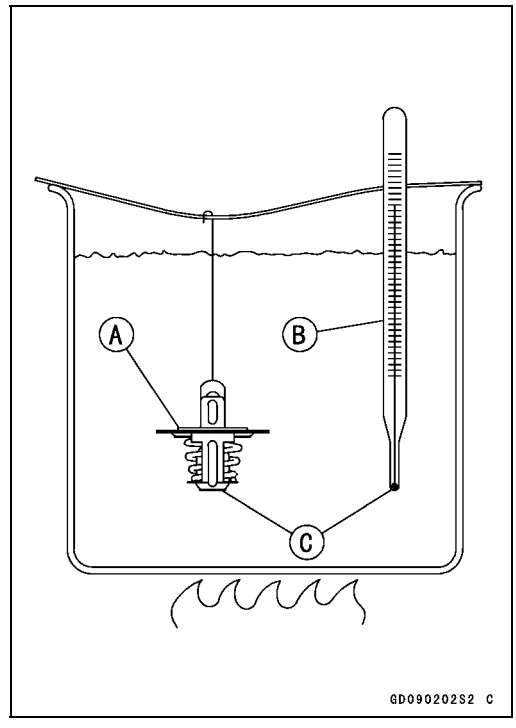
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

Thermostat Inspection



- Remove the thermostat (see Thermostat Removal), and inspect the thermostat valve [A] at room temperature.

★If the valve is open, replace the thermostat with a new one.



- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.

○The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth. It must not touch the container, either.

★If the measurement is out of the specified range, replace the thermostat with a new one.

Thermostat Valve Opening Temperature
58 ~ 62°C (136 ~ 144°F)

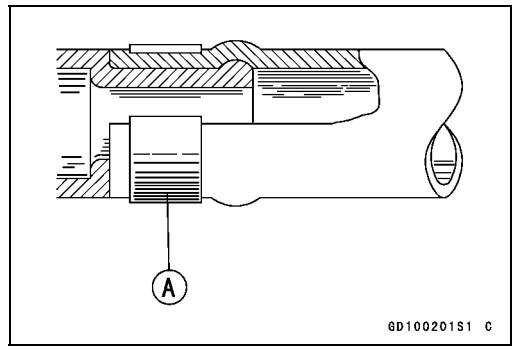
Hose and Pipes

Hose Installation

- Install the hoses and pipes, being careful to follow bending direction. Avoid sharp bending, kinking, flattening or twisting.
- Run the hoses (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the clamp [A] as near as possible to the hose end to clear the raised rib of the fitting. This will prevent the hoses from working loose.

○The clamp screws should be positioned correctly to prevent the clamps from contacting the other parts.

Torque - Radiator (Water) Hose Clamp Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)



Hose Inspection

- Refer to the Radiator Hose Damage and Installation Condition Inspection in the Periodic Maintenance chapter.

Water Temperature Sensor

NOTICE

The water temperature sensor should never be allowed to fall on a hard surface. Such a shock to the water temperature sensor can damage it.

Water Temperature Sensor Removal/Installation

- Refer to the Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter.

Water Temperature Sensor Inspection

- Refer to the Water Temperature Sensor Inspection in the Electrical System chapter.

Engine Top End

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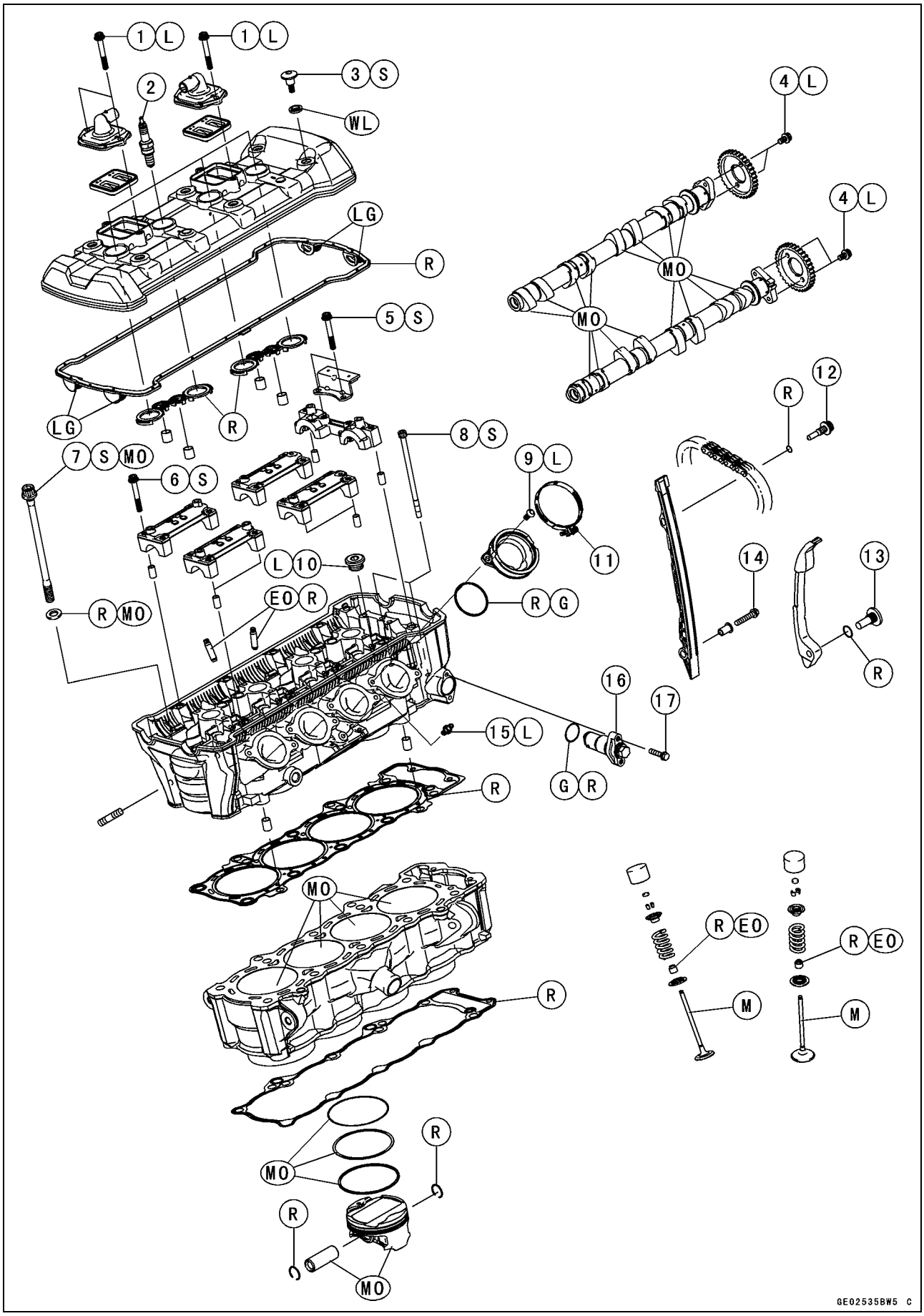
Exploded View

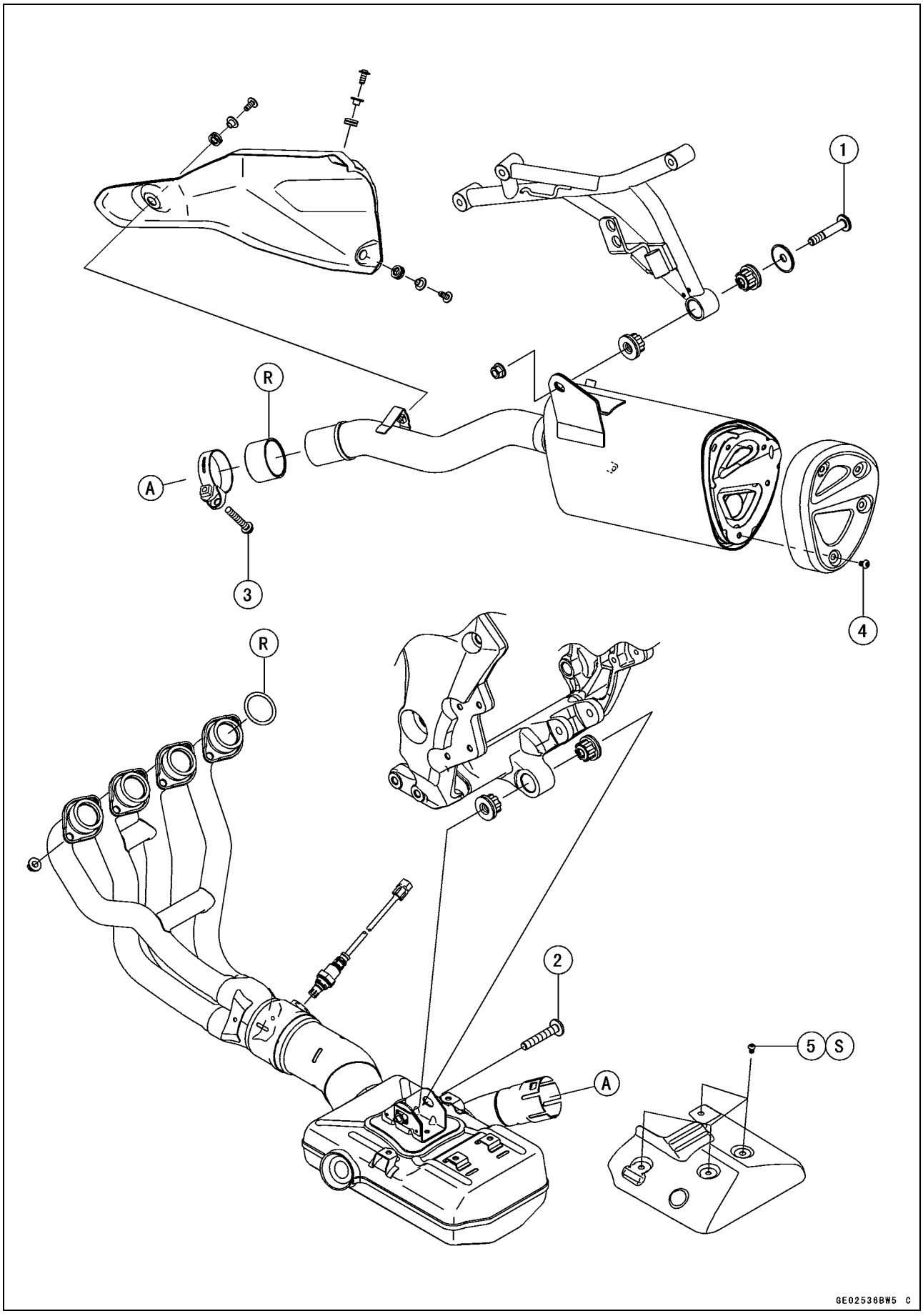


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	L
2	Spark Plugs	13	1.3	115 in·lb	
3	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
4	Camshaft Sprocket Bolts	15	1.5	11	L
5	Upper Camshaft Chain Guide Bolts	12	1.2	106 in·lb	S
6	Camshaft Cap Bolts	12	1.2	106 in·lb	S
7	Cylinder Head Bolts (M10) (First)	20	2.0	15	S, MO
	Cylinder Head Bolts (M10) (Final)	54	5.5	40	S, MO
8	Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
9	Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
10	Plugs	19.6	2.00	14.5	L
11	Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
12	Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
13	Rear Camshaft Chain Guide Bolt	25	2.5	18	
14	Front Camshaft Chain Guide Bolt (Lower)	12	1.2	106 in·lb	
15	Coolant By-pass Fitting Bolt	8.8	0.90	78 in·lb	L
16	Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
17	Camshaft Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.
WL: Apply soap and water solution or rubber lubricant.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Muffler Body Mounting Bolt	34	3.5	25	
2	Premuffler Chamber Mounting Bolt	34	3.5	25	
3	Muffler Body Clamp Bolt	21	2.1	15	
4	Muffler Body End Cover Bolts	9.8	1.0	87 in·lb	
5	Premuffler Chamber Guard Bolts	9.8	1.0	87 in·lb	S

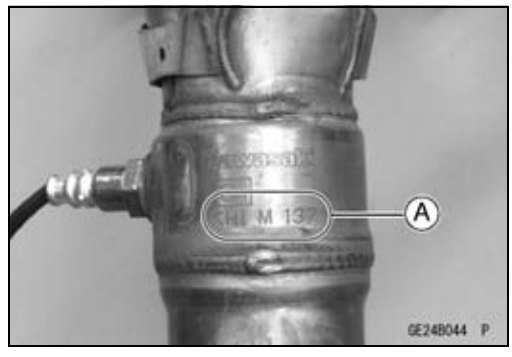
R: Replacement Parts
S: Follow the specified tightening sequence.

Exhaust System Identification

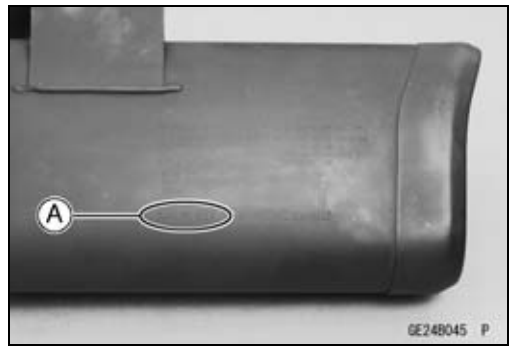
MANIFOLD	MUFFLER BODY	SPECIFICATION	MODEL
Honeycomb Type Catalyst with Oxygen Sensor P/No. 39178-0170 Mark: KHI M 137	Non-Catalyst P/No. 18091-0778 Mark: KHI K 617 EPA Noise Emission Control Information	WVTA (FULL H) GB WVTA (FULL H) WVTA (78.2 H) SEA-B2 AU BR CA	KLZ1000AC KLZ1000AC KLZ1000AC KLZ1000AC KLZ1000AC KLZ1000AC KLZ1000AC

GE24731B F

Exhaust Pipe Mark Position [A]

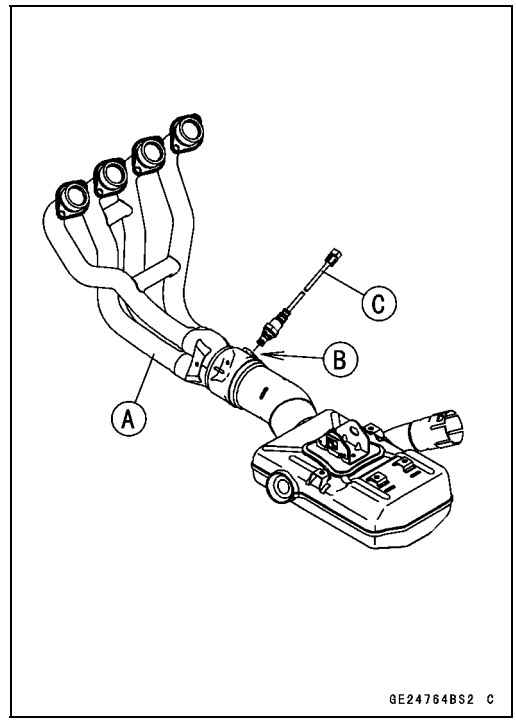


Muffler Body Mark Position [A]

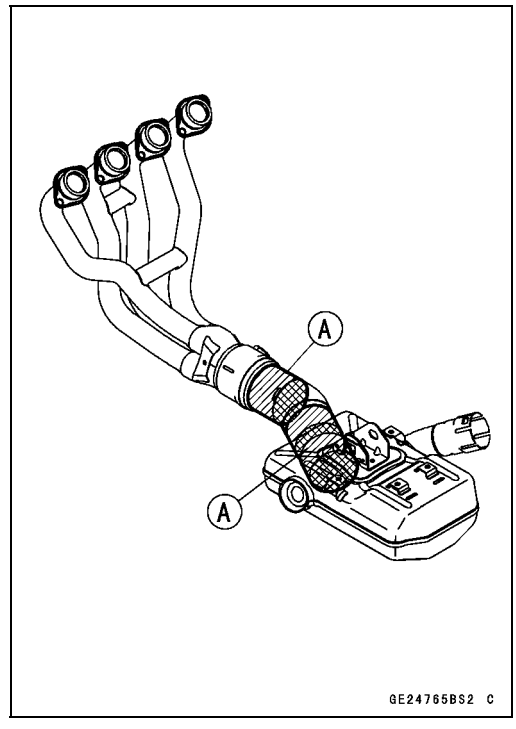


Exhaust System Identification

Exhaust Pipe [A] with Hole [B] for Oxygen Sensor [C]



Honeycomb Type Catalyst Positions [A]



Specifications

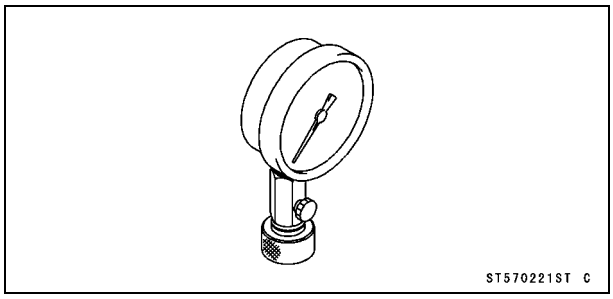
Item	Standard	Service Limit
Camshafts		
Cam Height:		
Exhaust	32.943 ~ 33.057 mm (1.2970 ~ 1.3015 in.)	32.84 mm (1.293 in.)
Intake	32.943 ~ 33.057 mm (1.2970 ~ 1.3015 in.)	32.84 mm (1.293 in.)
Camshaft Journal, Camshaft Cap Clearance	0.038 ~ 0.081 mm (0.0015 ~ 0.0032 in.)	0.17 mm (0.0067 in.)
Camshaft Journal Diameter	23.940 ~ 23.962 mm (0.9425 ~ 0.9434 in.)	23.91 mm (0.9413 in.)
Camshaft Bearing Inside Diameter	24.000 ~ 24.021 mm (0.9449 ~ 0.9457 in.)	24.08 mm (0.9480 in.)
Camshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
Cylinder Head		
Cylinder Compression	(Usable Range) 770 ~ 1 198 kPa (7.9 ~ 12.2 kgf/cm², 112 ~ 174 psi) at 236 r/min (rpm)	– – –
Cylinder Head Warp	– – –	0.05 mm (0.002 in.)
Valves		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	– – –
Intake	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	– – –
Valve Head Thickness:		
Exhaust	0.8 mm (0.031 in.)	0.6 mm (0.024 in.)
Intake	0.5 mm (0.020 in.)	0.3 mm (0.012 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	4.455 ~ 4.470 mm (0.1754 ~ 0.1760 in.)	4.44 mm (0.175 in.)
Intake	4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in.)	4.46 mm (0.176 in.)
Valve Guide Inside Diameter:		
Exhaust	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.180 in.)
Intake	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.180 in.)
Valve/Valve Guide Clearance (Wobble Method):		
Exhaust	0.09 ~ 0.16 mm (0.0035 ~ 0.0063 in.)	0.36 mm (0.014 in.)
Intake	0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)	0.29 mm (0.011 in.)
Valve Seat Cutting Angle	32°, 45°, 60°	– – –
Valve Seating Surface:		
Width:		
Exhaust	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	– – –
Intake	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	– – –
Outside Diameter:		
Exhaust	24.7 ~ 24.9 mm (0.972 ~ 0.980 in.)	– – –
Intake	28.9 ~ 29.1 mm (1.138 ~ 1.146 in.)	– – –
Valve Spring Free Length:		
Exhaust	35.9 mm (1.41 in.)	34.7 mm (1.37 in.)
Intake	35.9 mm (1.41 in.)	34.7 mm (1.37 in.)

Specifications

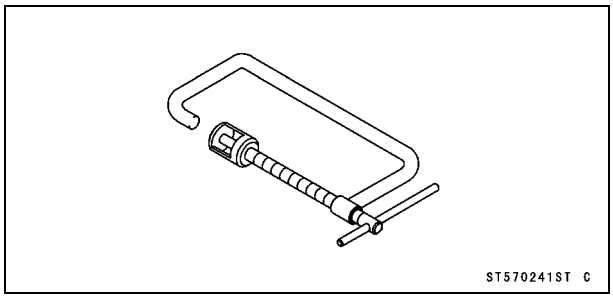
Item	Standard	Service Limit
Cylinder, Pistons		
Cylinder Inside Diameter	76.990 ~ 77.006 mm (3.0311 ~ 3.0317 in.)	77.09 mm (3.035 in.)
Piston Diameter	76.974 ~ 76.984 mm (3.0305 ~ 3.0309 in.)	76.82 mm (3.024 in.)
Piston/Cylinder Clearance	0.010 ~ 0.032 mm (0.0004 ~ 0.0013 in.)	– – –
Piston Ring/Groove Clearance:		
Top	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Second	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)	0.16 mm (0.0063 in.)
Piston Ring Groove Width:		
Top	0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)	0.92 mm (0.0362 in.)
Second	0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)	0.91 mm (0.0358 in.)
Piston Ring Thickness:		
Top	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Second	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Piston Ring End Gap:		
Top	0.20 ~ 0.30 mm (0.0079 ~ 0.0118 in.)	0.6 mm (0.024 in.)
Second	0.38 ~ 0.48 mm (0.0150 ~ 0.0189 in.)	0.8 mm (0.031 in.)

Special Tools and Sealant

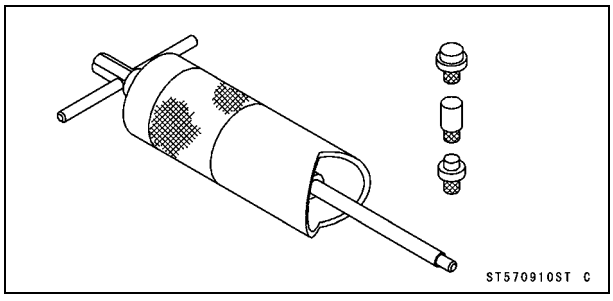
Compression Gauge, 20 kgf/cm²:
57001-221



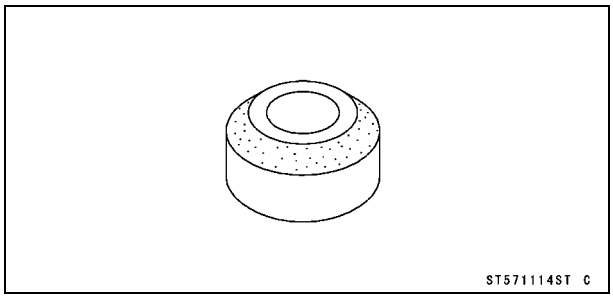
Valve Spring Compressor Assembly:
57001-241



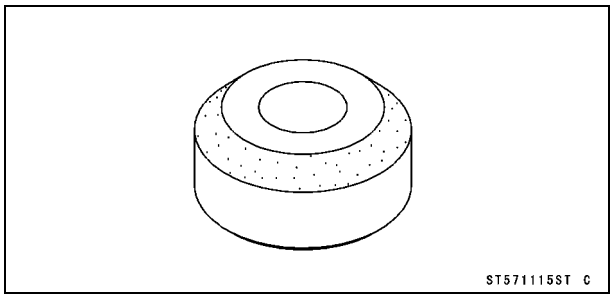
Piston Pin Puller Assembly:
57001-910



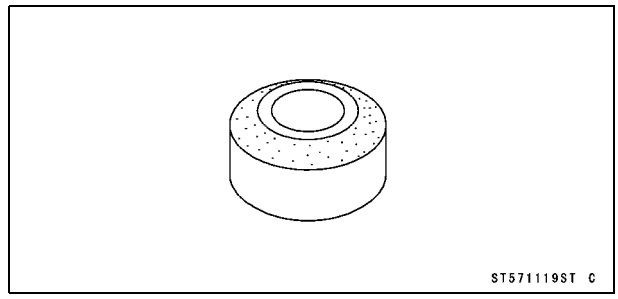
Valve Seat Cutter, 45° - ϕ27.5:
57001-1114



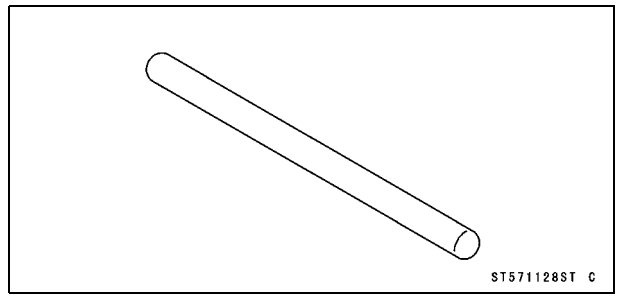
Valve Seat Cutter, 45° - ϕ32:
57001-1115



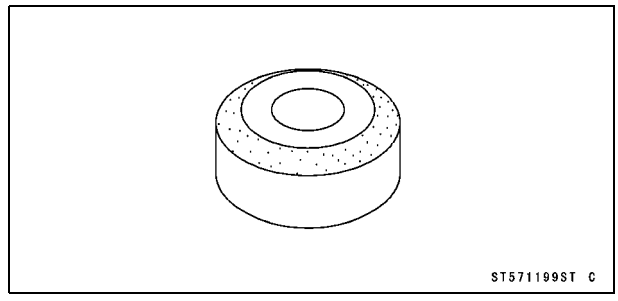
Valve Seat Cutter, 32° - ϕ28:
57001-1119



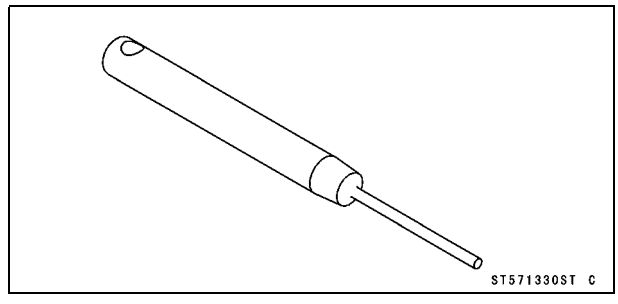
Valve Seat Cutter Holder Bar:
57001-1128



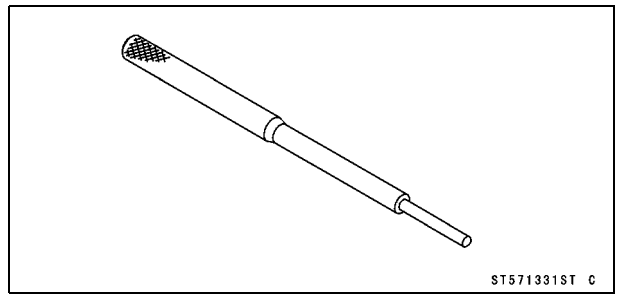
Valve Seat Cutter, 32° - ϕ33:
57001-1199



Valve Seat Cutter Holder, ϕ4.5:
57001-1330

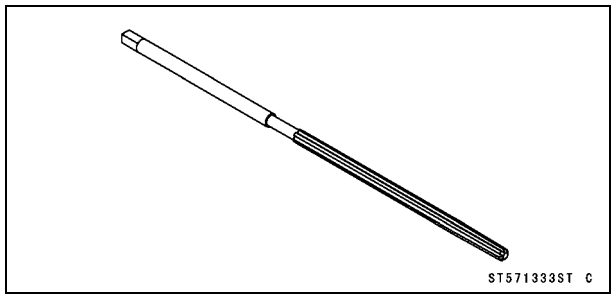


Valve Guide Arbor, ϕ4.5:
57001-1331

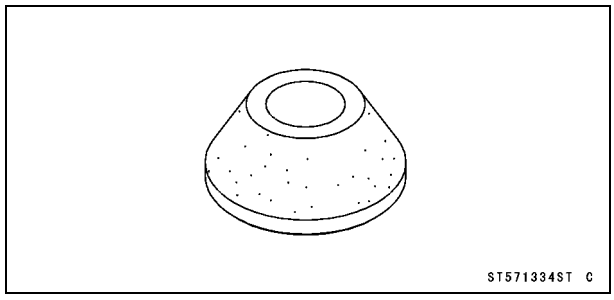


Special Tools and Sealant

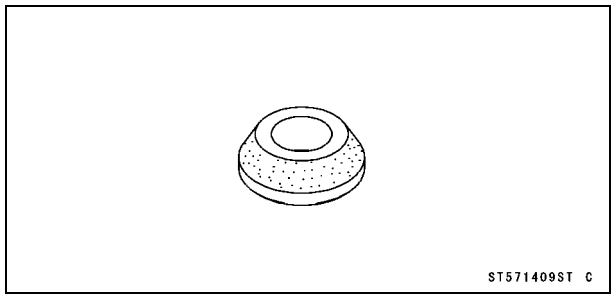
Valve Guide Reamer, ϕ4.5:
57001-1333



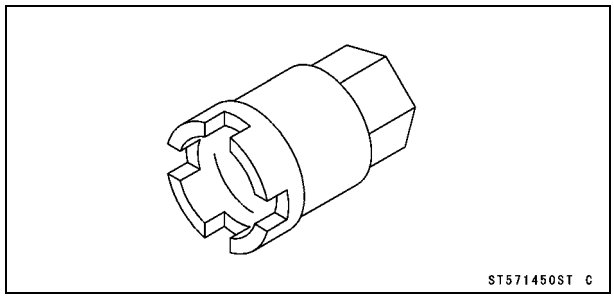
Valve Seat Cutter, 60° - ϕ33:
57001-1334



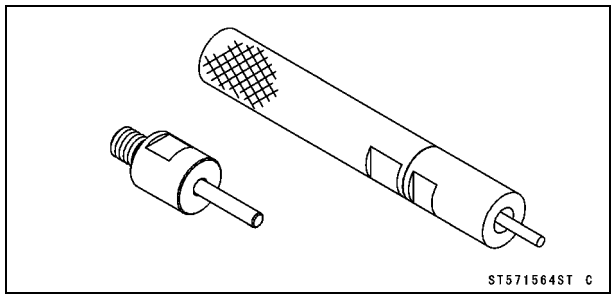
Valve Seat Cutter, 60° - ϕ27:
57001-1409



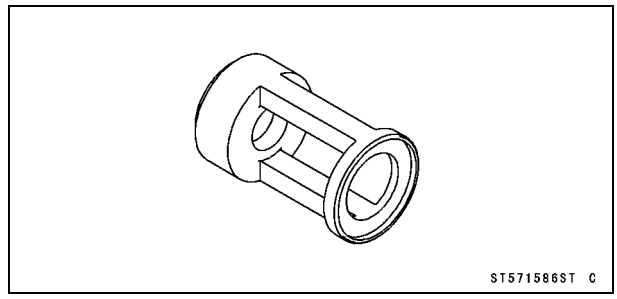
Engine Mount Nut Wrench:
57001-1450



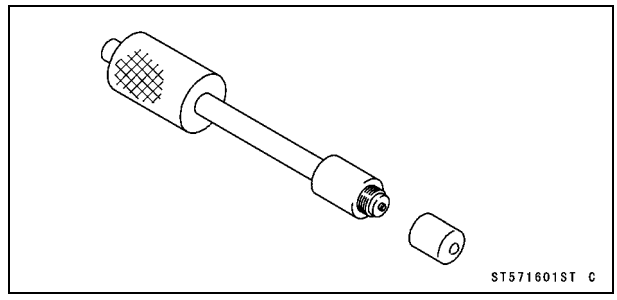
Valve Guide Driver:
57001-1564



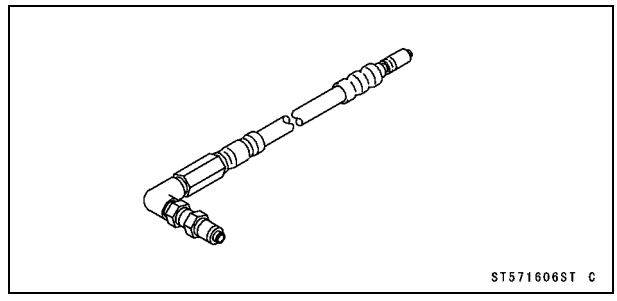
Valve Spring Compressor Adapter, ϕ24:
57001-1586



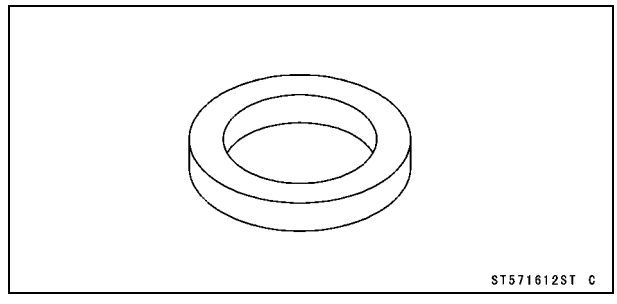
Compression Gauge Adapter, M10 × 1.0:
57001-1601



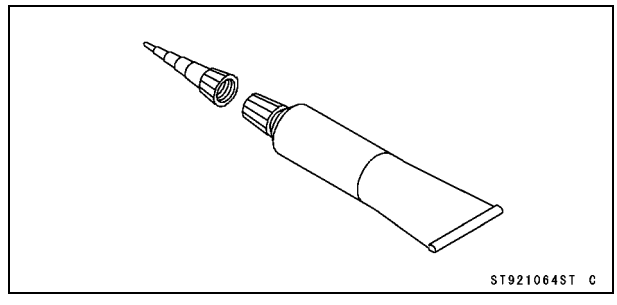
L-Shape Hose:
57001-1606



Washer:
57001-1612

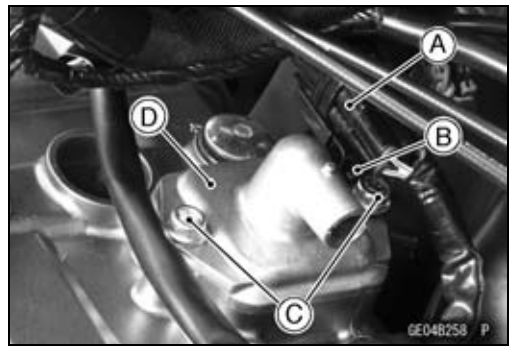


Liquid Gasket, TB1216B:
92104-1064



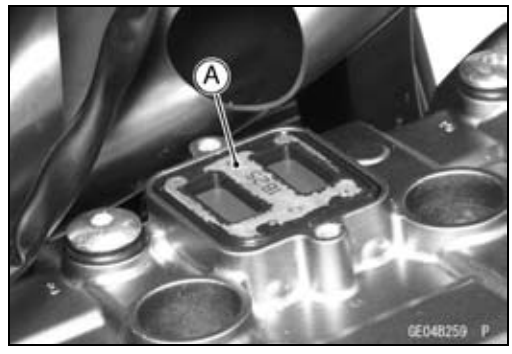
Clean Air System

Air Suction Valve Removal



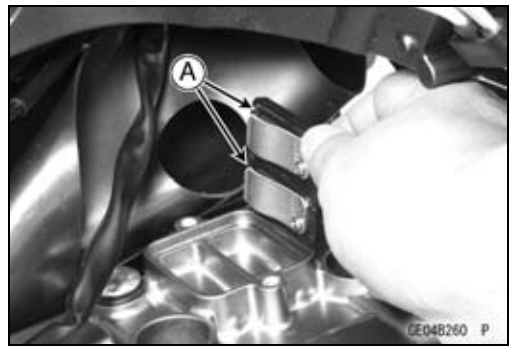
- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Air Switching Valve (see Air Switching Valve Removal)
  Stick Coil Connector (see Stick Coil Removal in the Electrical System chapter)
  Connector [A] (from Bracket [B] at Left Side)
  Air Suction Valve Cover Bolts [C] and Bracket
  Air Suction Valve Covers [D] (Both Sides)

- Remove the air suction valve [A] on both sides.



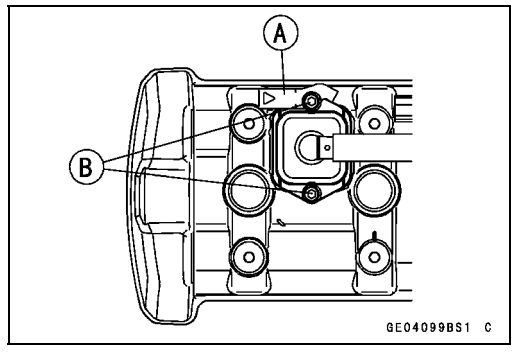
Air Suction Valve Installation

- Install the air suction valve so that opening [A] of the reed faces the front and downward.



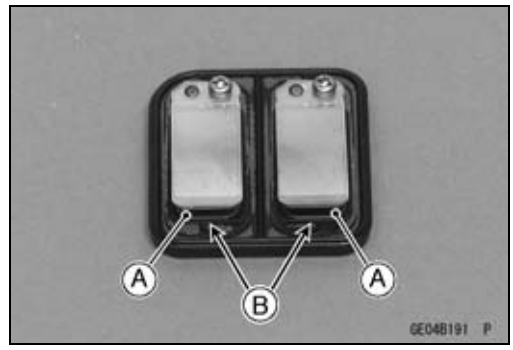
- Install the bracket [A] as shown in the figure.
- Apply a non-permanent locking agent to the threads of the air suction valve cover bolts [B], and tighten them.

  Torque - Air Suction Valve Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Clean Air System

Air Suction Valve Inspection



- Remove the air suction valve (see Air Suction Valve Removal).
- Visually inspect the reeds [A] for cracks, folds, warps, heat damage or other damage.

★If there is any doubt as to the condition of the reeds, replace the air suction valve as an assembly.

- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.

★If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.

★If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high flash-point solvent.

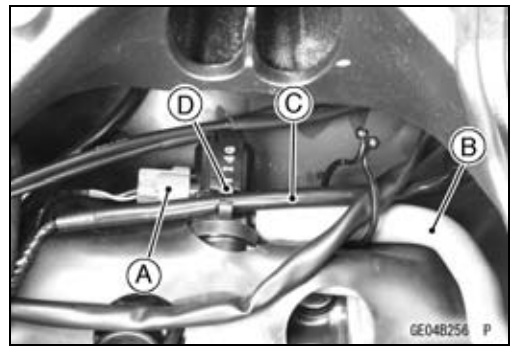
NOTICE

Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.

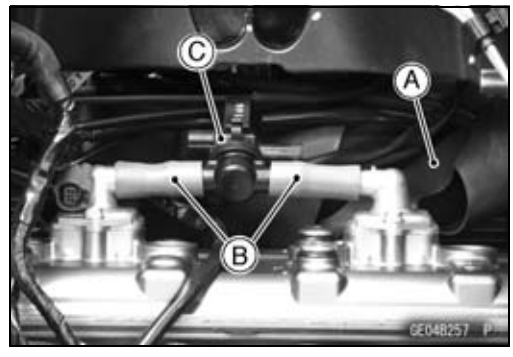
Air Switching Valve Removal

NOTICE

Never drop the air switching valve especially on a hard surface. Such a shock to the air switching valve can damaged it.

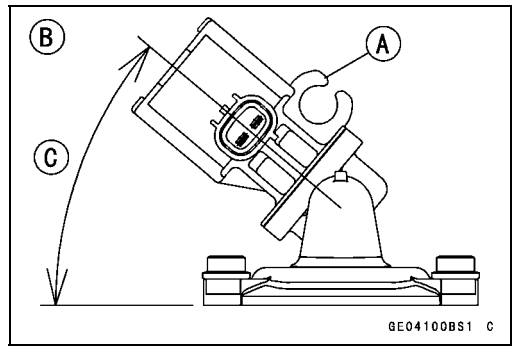


- Remove the stick coils (see Stick Coil Removal in the Electrical System chapter).
- Disconnect the connector [A] and the hose [B].
- Clear the harness [C] from the clamp [D].



- Pull up the rubber cover [A] forward.
- Disconnect the hoses [B] from the air switching valve [C] and remove the air switching valve.

Air Switching Valve Installation



- Install the air switching valve [A] as shown in the figure.
  [B] Viewed Left Side
  [C] About 40°

Air Switching Valve Operation Test

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Clean Air System

Air Switching Valve Unit Test

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

Clean Air System Hose Inspection

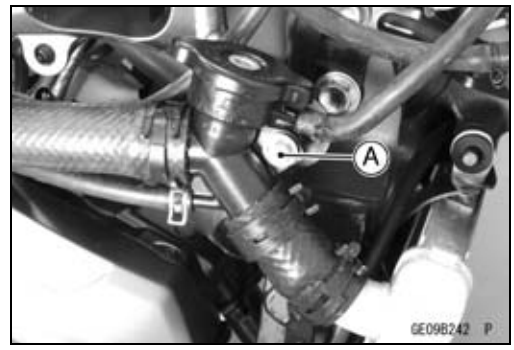
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, air switching valve and air suction valve covers.

★If they are not, correct them. Replace them if they are damaged.

Cylinder Head Cover

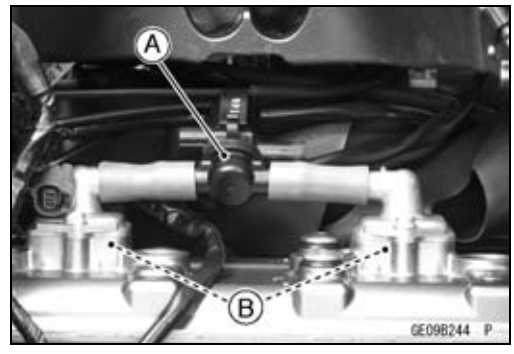
Cylinder Head Cover Removal

- Remove:
  Side Cover (see Side Cover Removal in the Frame chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
- Remove:
  Radiator Cap Mounting Bolt [A] and Collar

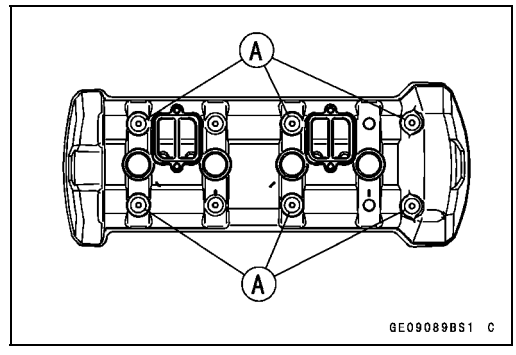


- Remove the stick coils [A] from the spark plugs (see Stick Coil Removal in the Electrical System chapter).
- Pull up the rubber cover [B] forward so that it clears from the cylinder head cover.

- Remove the air switching valve [A] (see Air Switching Valve Removal).
- Remove the air suction valves [B] (see Air Suction Valve Removal).

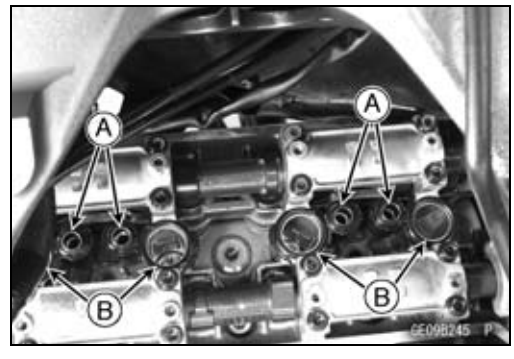


- Remove:
  Cylinder Head Cover Bolts [A]
  Cylinder Head Cover



Cylinder Head Cover Installation

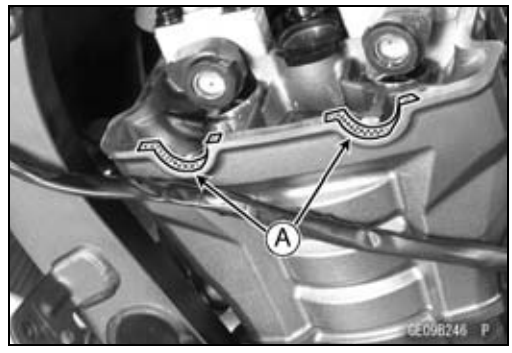
- Install:
  Dowel Pins [A]
  Plug Hole Gaskets [B]

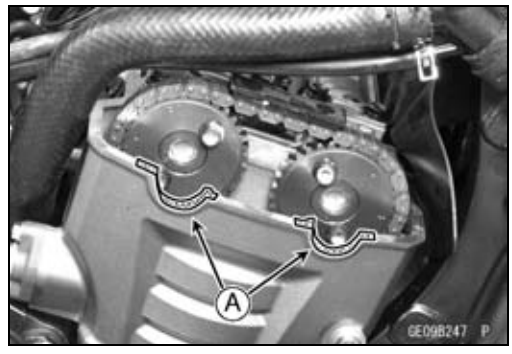


Cylinder Head Cover

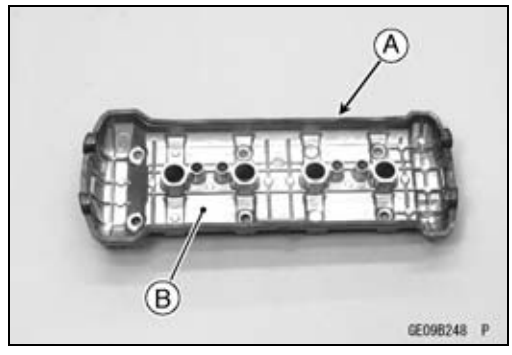
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the cylinder head as shown.

Sealant - Liquid Gasket, TB1216B: 92104-1064





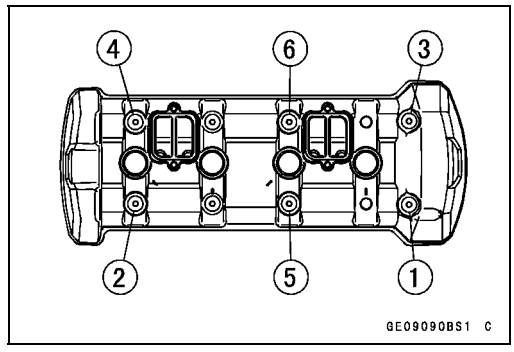
- Replace the head cover gasket [A] with a new one.
- Install the gasket to the cylinder head cover [B].



- Install the cylinder head cover from the left side.
- Position the cylinder head cover properly while pulling up the water hose on the right side.
- Apply sorp and water solution or rubber lubricant to the both surface of the washers.
- Install the washers with the metal side [A] faces upward.

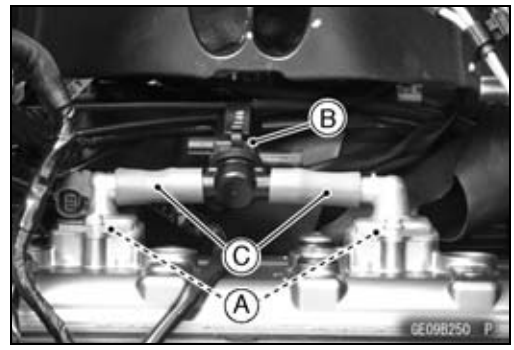
- Tighten the cover bolts following the specified tightening sequence.

Torque - Cylinder Head Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Cylinder Head Cover

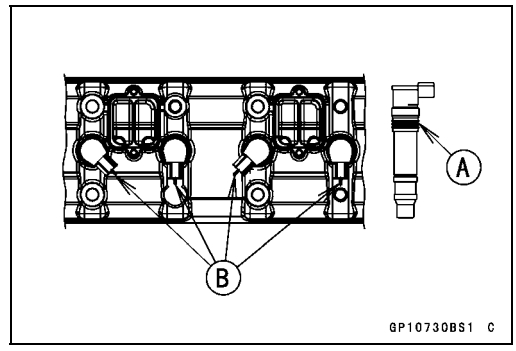
- Install:
  Air Suction Valves [A] (see Air Suction Valve Installation)
  Air Switching Valve [B] (see Air Switching Valve Installation)
  Hoses [C]
- Position the rubber cover on the cylinder head cover.



- Apply a thin coat of grease [A] to the stick coils for easy installation.
- Insert the stick coils so that the coil heads align with the lines [B] on the cylinder head cover.

NOTICE

Do not tap the coil head while installing the coil.

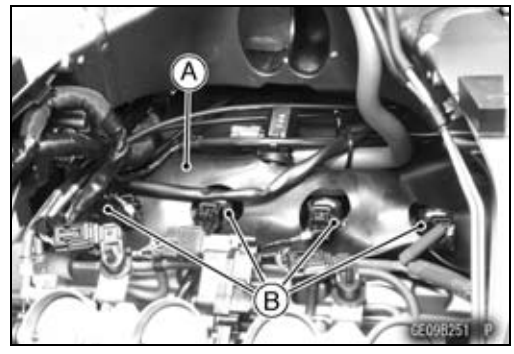


- After installation, be sure the stick coils are installed securely by pulling up them lightly.

- Reposition the rubber cover [A] and connect the stick coil connectors [B].
- Run the hoses and harness correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

NOTE

○*Be careful not to tight the stick coil leads.*



- Install the removed parts (see appropriate chapters).

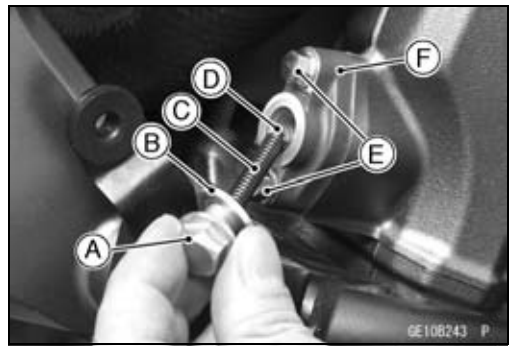
Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

NOTICE

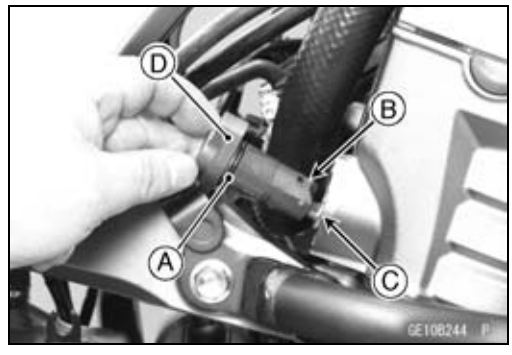
This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below.
When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation".
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.

- Remove:
  Right Side Cover (see Side Cover Removal in the Frame chapter)
  Cap Bolt [A]
  Washer [B]
  Spring [C]
  Rod [D]
  Mounting Bolts [E]
  Camshaft Chain Tensioner [F]



Camshaft Chain Tensioner Installation

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Release the stopper [B] and push the push rod [C] into the tensioner body [D].
- Install the tensioner body so that the stopper faces upward.



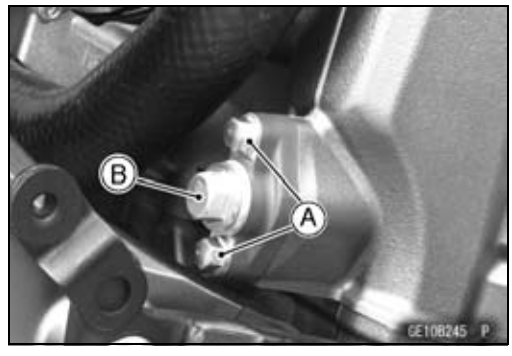
- Install the mounting bolts [A].
- Tighten:

Torque - Camshaft Chain Tensioner Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Install the rod, spring and washer.
- Tighten:

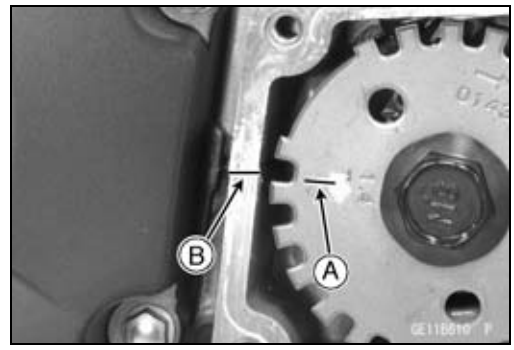
Torque - Camshaft Chain Tensioner Cap Bolt [B]: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand.

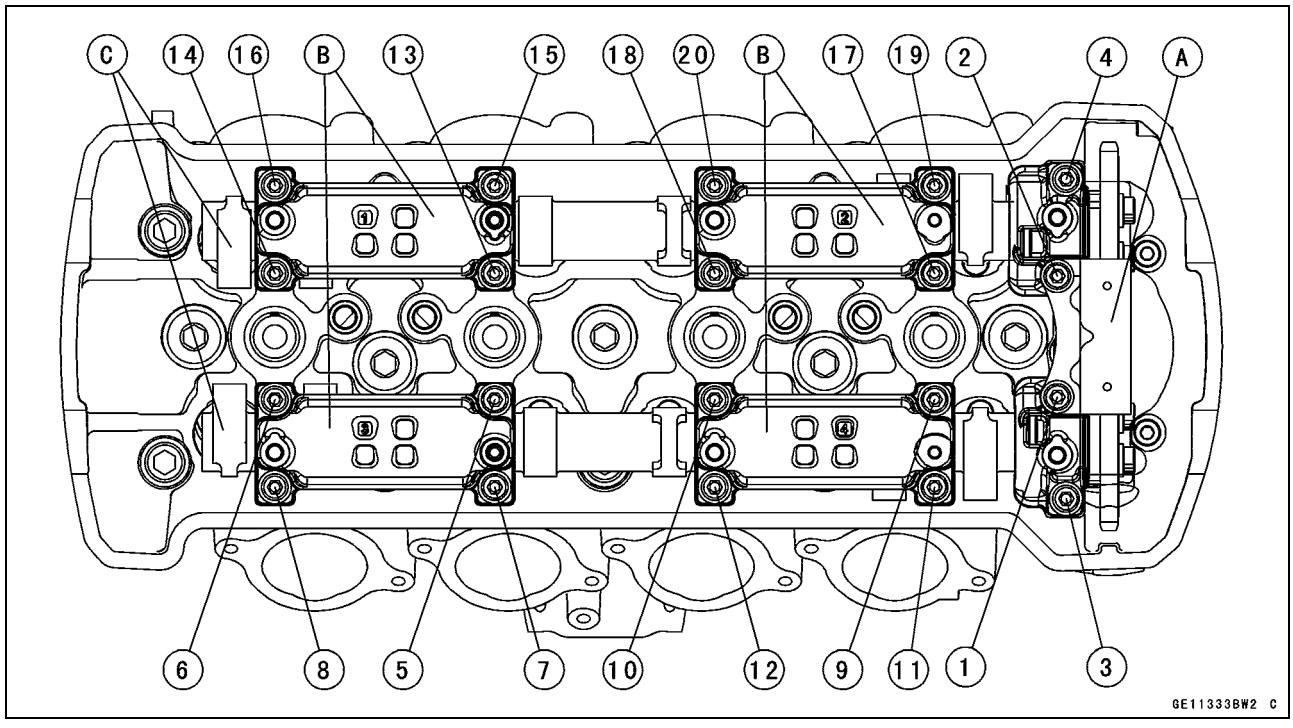


Camshaft, Camshaft Chain

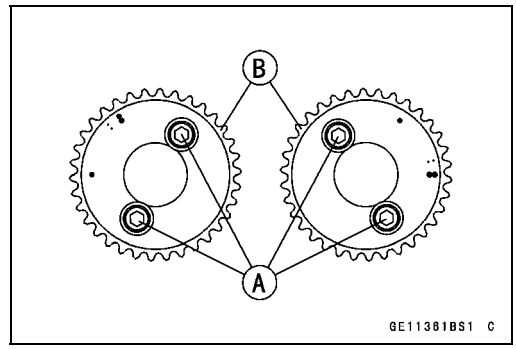
Camshaft Removal



- Remove:
  Cylinder Head Cover (see Cylinder Head Cover Removal)
  Crankshaft Sensor Cover (see Crankshaft Sensor Removal in the Electrical System chapter)
- Turn the crankshaft clockwise, align the #1, 4 mark on the timing rotor with the crankcase timing mark.
  TDC mark [A] for #1, 4 Pistons
  Timing Mark (Crankcase Halves Mating Surface) [B]
- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
- Loosen the upper chain guide bolts and camshaft cap bolts as shown sequence [1 ~ 20] in the figure, and remove them.
- Remove:
  Upper Chain Guide [A]
  Camshaft Caps [B]
  Camshafts [C]
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.



- Remove:
  Camshaft Sprocket Mounting Bolts [A]
  Camshaft Sprockets [B]



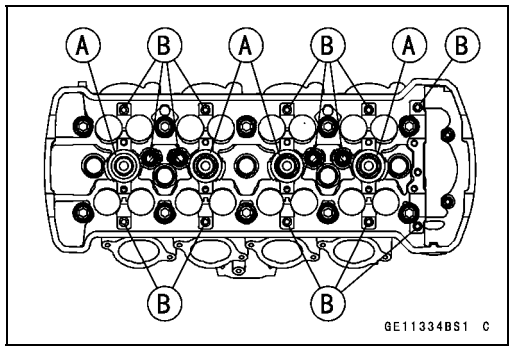
NOTICE

The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

Camshaft, Camshaft Chain

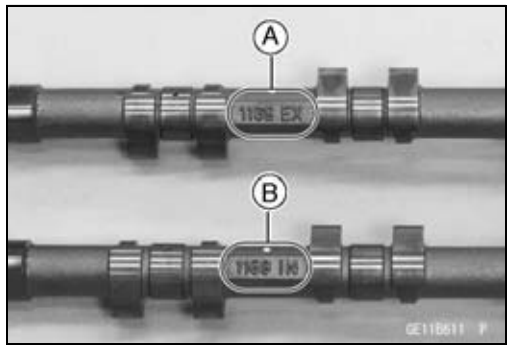
Camshaft Installation

- Be sure to install the following parts.
  Plug Hole Gaskets [A]
  Dowel Pins [B]



NOTE

○*The exhaust camshaft has a 1169 EX mark [A] and the intake camshaft has a 1169 IN mark [B]. Be careful not to mix up these shafts.*



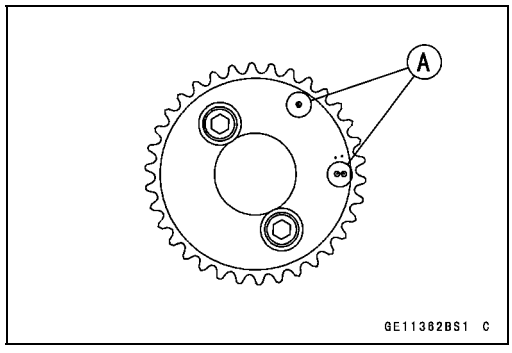
- Install the camshaft sprockets so that position the timing marks [A] outside.

○The intake camshaft sprocket and exhaust camshaft sprocket are identical.

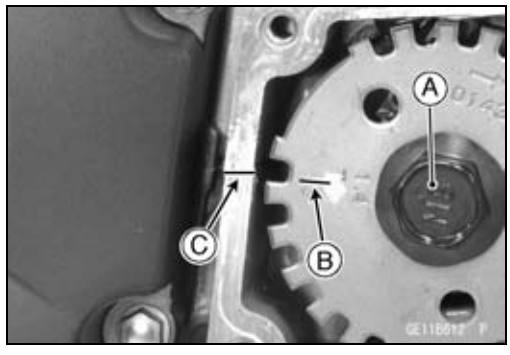
- Apply a non-permanent locking agent to the threads of the camshaft sprocket bolts and tighten them.

  Torque - Camshaft Sprocket Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Apply molybdenum disulfide oil solution to all cam parts and journals.



- Using a wrench on the timing rotor bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the timing rotor is aligned with the timing mark [C] (Crankcase Halves Mating Surface).



NOTICE

The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

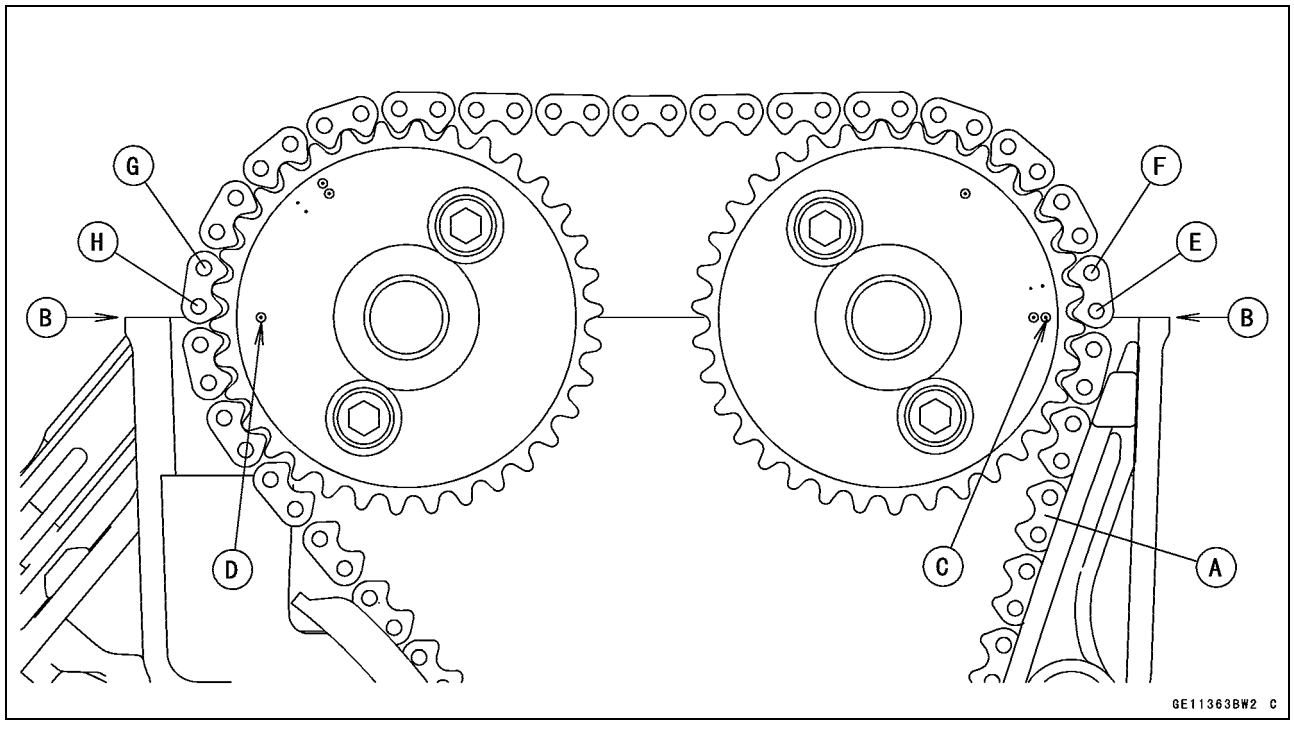
Camshaft, Camshaft Chain

- Pull the tension side (exhaust side) [A] of the chain taut to install the chain.
- Engage the camshaft chain with the sprockets so that timing marks on the sprockets are positioned as shown in the figure.

○Use the one punch mark on the sprocket as IN mark and the two punch marks as EX mark.

○The timing marks must be aligned with the cylinder head upper surface [B].

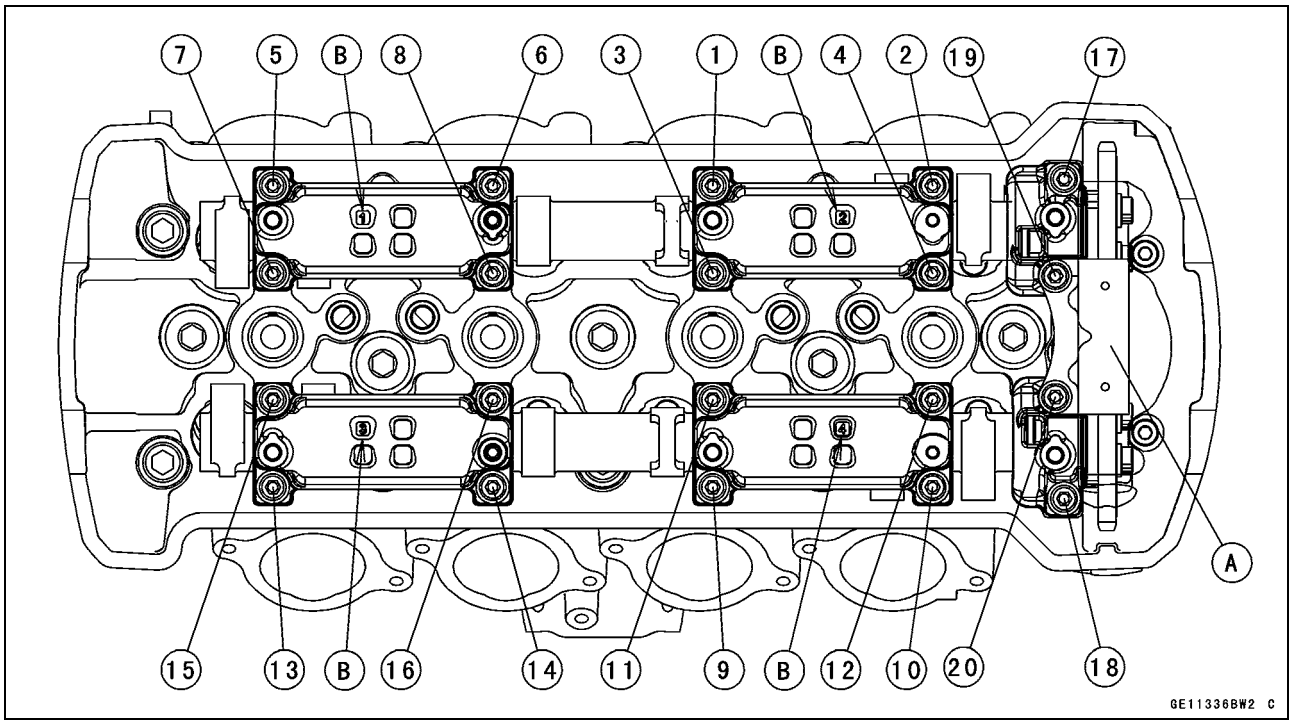
EX mark (Tow punch marks) [C]
IN mark (One punch mark) [D]
#1 pin [E]
#2 pin [F]
#29 pin [G]
#30 pin [H]



Camshaft, Camshaft Chain

- Before installing the camshaft caps and upper chain guide, install the camshaft chain tensioner body temporarily (see Camshaft Chain Tensioner Installation).
- Install the camshaft caps and upper camshaft chain guide [A] as shown in the figure.
  Identification No. 1 ~ 4 (Camshaft Cap) [B]
- First tighten the all camshaft cap bolts and upper camshaft chain guide bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

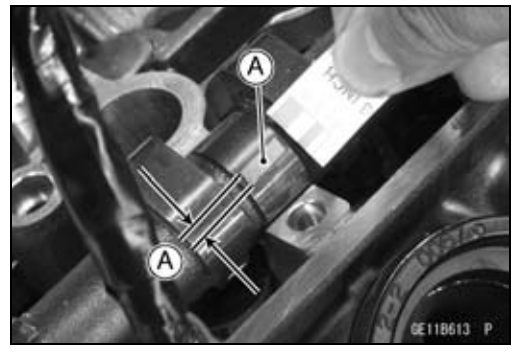
Torque - Camshaft Cap Bolts [1 ~ 18]: 12 N·m (1.2 kgf·m, 106 in·lb)
Upper Camshaft Chain Guide Bolts [19, 20]: 12 N·m (1.2 kgf·m, 106 in·lb)



- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.
- Install the cylinder head cover (see Cylinder Head Cover Installation).

Camshaft, Camshaft Chain

Camshaft, Camshaft Cap Wear Inspection



- Remove:
  Upper Chain Guide (see Camshaft Removal)
  Camshaft Caps (see Camshaft Removal)
- Cut strips of plastigage (press gauge) to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Measure each clearance between the camshaft journal and the camshaft cap using plastigage [A].
- Tighten the camshaft cap bolts (see Camshaft Installation).

NOTE

○*Do not turn the camshaft when the plastigage is between the journal and camshaft cap.*

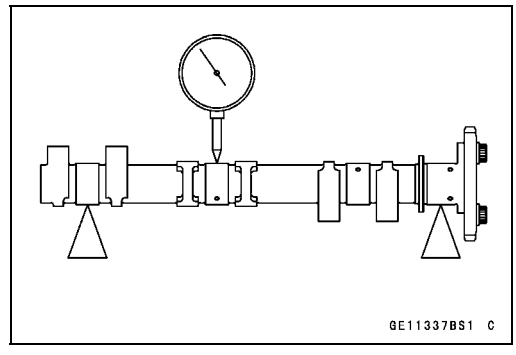
Camshaft Journal, Camshaft Cap Clearance
Standard: 0.038 ~ 0.081 mm (0.0015 ~ 0.0032 in.)
Service Limit: 0.17 mm (0.0067 in.)

★If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

Camshaft Journal Diameter
Standard: 23.940 ~ 23.962 mm (0.9425 ~ 0.9434 in.)
Service Limit: 23.91 mm (0.9413 in.)

★If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.
★If the clearance still remains out of the limit, replace the cylinder head unit.

Camshaft Runout Inspection



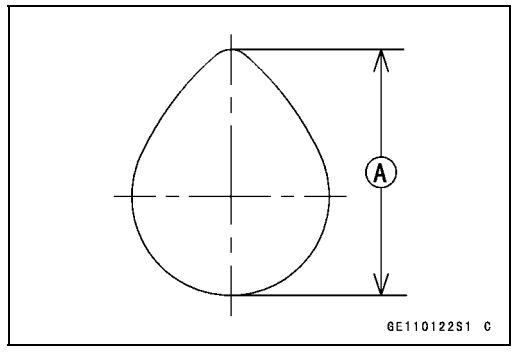
- Remove the camshafts (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure runout with a dial gauge at the specified place as shown in the figure.

★If the runout exceeds the service limit, replace the shaft.

Camshaft Runout
Standard: TIR 0.02 mm (0.0008 in.) or less
Service Limit: TIR 0.1 mm (0.004 in.)

Camshaft, Camshaft Chain

Cam Wear Inspection



- Remove the camshafts (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.

★If the cams are worn down past the service limit, replace the camshaft.

Cam Height

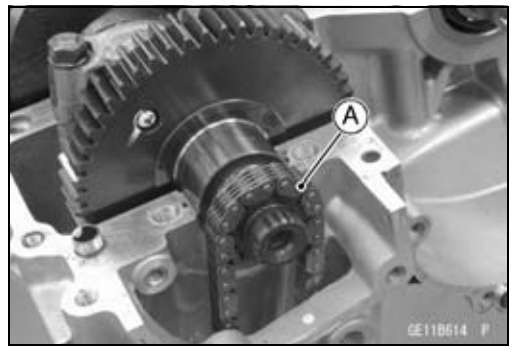
Standard:

Exhaust	**32.943 ~ 33.057 mm (1.2970 ~ 1.3015 in.)**
Intake	**32.943 ~ 33.057 mm (1.2970 ~ 1.3015 in.)**

Service Limit:

Exhaust	**32.84 mm (1.293 in.)**
Intake	**32.84 mm (1.293 in.)**

Camshaft Chain Removal



- Split the crankcase (see Crankcase Splitting in the Crankshaft/Transmission chapter).
- Remove the camshaft chain [A] from the crankshaft sprocket.

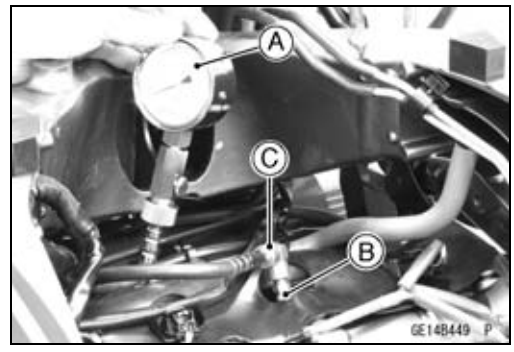
Cylinder Head

Cylinder Compression Measurement

NOTE

○*Use the battery which is fully charged.*

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
  Stick Coils (see Stick Coil Removal in the Electrical System chapter)
  Spark Plugs (see Spark Plug Replacement in the Periodic Maintenance chapter)



- Attach the compression gauge [A], adapter [B] and hose [C] firmly into the spark plug hole.

○Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

Special Tools - Compression Gauge, 20 kgf/cm²: 57001-221
Compression Gauge Adapter, M10 × 1.0: 57001-1601
L-Shape Hose: 57001-1606

Cylinder Compression
Usable Range: 770 ~ 1 198 kPa (7.9 ~ 12.2 kgf/cm², 112 ~ 174 psi) at 236 r/min (rpm)

- Repeat the measurement for the other cylinders.
- Install the spark plugs.

Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 115 in·lb)

○The following table should be consulted if the obtainable compression reading is not within the usable range.

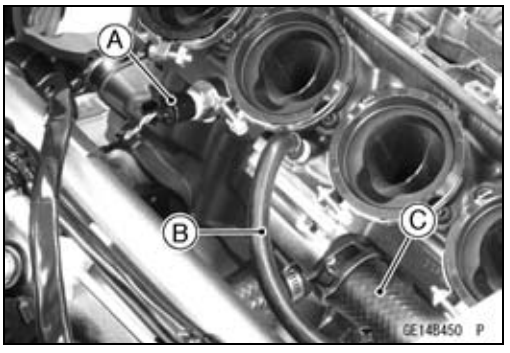
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket thickness	Replace the gasket with a standard part.
Cylinder compression is lower than usable range	Gas leakage around cylinder head	Replace damaged check gasket and cylinder head warp.
	Bad condition of valve seating	Repair if necessary.
	Incorrect valve clearance	Adjust the valve clearance.
	Incorrect piston/cylinder clearance	Replace the piston and/or cylinder.
	Piston seizure	Inspect the cylinder and replace/repair the cylinder and/or piston as necessary.
	Bad condition of piston ring and/or piston ring grooves.	Replace the piston and/or the piston rings.

Cylinder Head

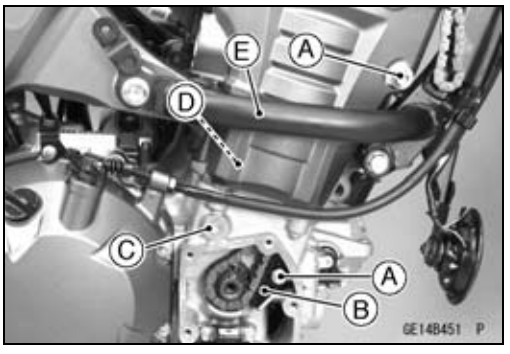
Cylinder Head Removal

● Remove:
Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
Camshafts (see Camshaft Removal)
Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
Exhaust Pipe (see Exhaust Pipe Removal)

● Disconnect the water temperature sensor connector [A].
● Remove:
Tube [B]
Water Hose [C]



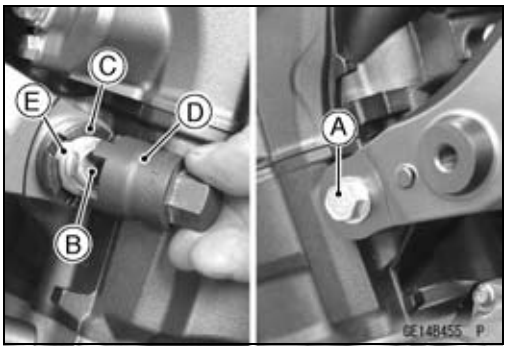
● Remove:
Timing Rotor (see Timing Rotor Removal in the Electrical System chapter)
Front Camshaft Chain Guide Bolts [A]
Front Camshaft Chain Guide [B]
Rear Camshaft Chain Guide Bolt [C]
Rear Camshaft Chain Guide [D]
Upper Engine Brackets (Both Sides) [E] (see Engine Removal in the Engine Removal/Installation chapter)



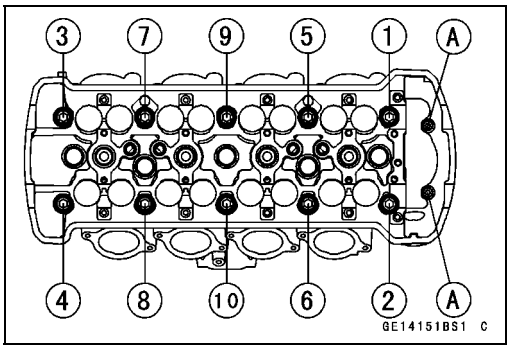
● Loosen:
Upper Engine Mounting Bolts (Left) [A]
● Remove:
Upper Engine Mounting Bolts (Right) [B]
● Loosen:
Upper Adjusting Collar Locknut [C]

Special Tool - Engine Mount Nut Wrench [D]: 57001-1450

● Loosen:
Upper Adjusting Collar [E]



● Remove the M6 cylinder head bolts [A].
● Loosen the M10 cylinder head bolts as shown sequence [1 ~ 10] in the figure, and remove them with washers.
● Remove the cylinder head.



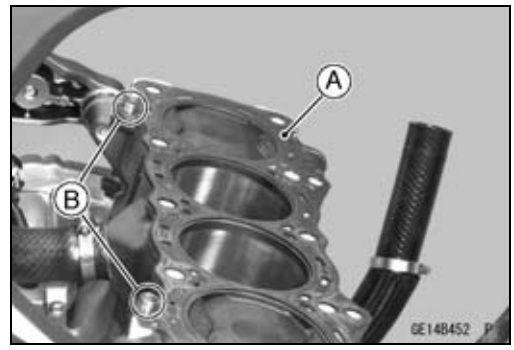
Cylinder Head Installation

NOTE

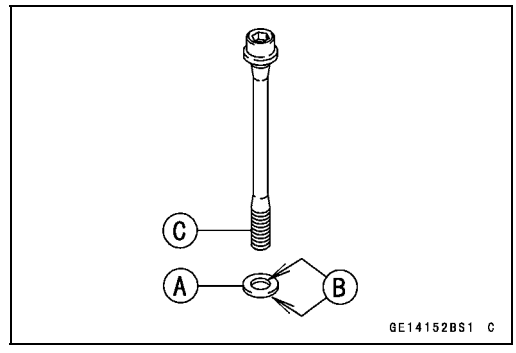
○*The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.*

Cylinder Head

- Replace the cylinder head gasket [A] with a new one.
- Install the dowel pins [B] and cylinder head gasket.



- Replace the cylinder head bolt washers [A] with new ones.
- Apply molybdenum disulfide oil solution to both sides [B] of the cylinder head bolt washers and threads [C] of the bolts.



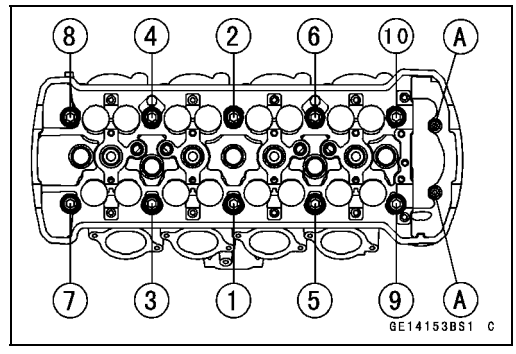
- Tighten the M10 cylinder head bolts following the tightening sequence [1 ~ 10].

Torque - Cylinder Head Bolts (M10):

First	**20 N·m (2.0 kgf·m, 15 ft·lb)**
Final	**54 N·m (5.5 kgf·m, 40 ft·lb)**

- Tighten:

Torque - Cylinder Head Bolts (M6) [A]: 12 N·m (1.2 kgf·m, 106 in·lb)



- Tighten the upper adjusting collar [A].

Torque - Upper Adjusting Collar: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Tighten the right and left upper engine mounting bolts [B] [C].

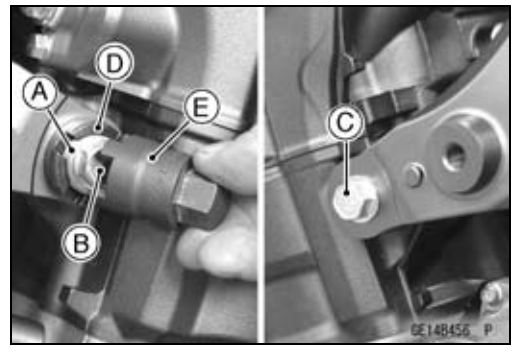
Torque - Upper Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Tighten the upper adjusting collar locknut [D].

Torque - Upper Adjusting Collar Locknut: 49 N·m (5.0 kgf·m, 36 ft·lb)

Special Tool - Engine Mount Nut Wrench [E]: 57001-1450

- Install the right and left engine brackets (see Engine Installation in the Engine Removal/Installation chapter).

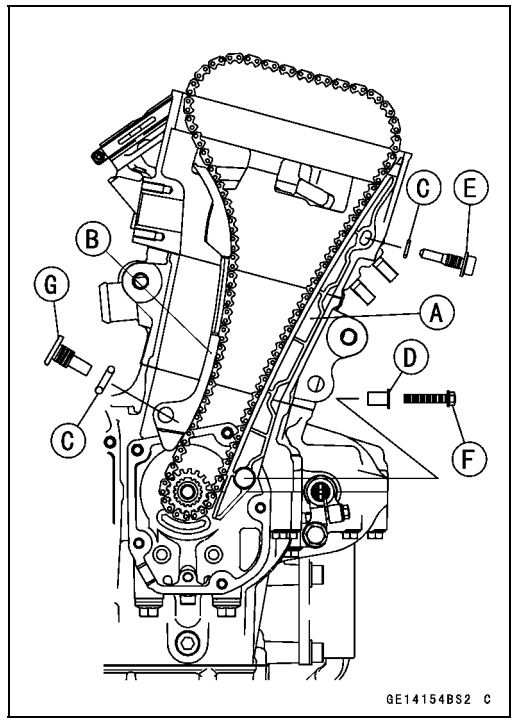


Cylinder Head

● Install:
Front Camshaft Chain Guide [A]
Rear Camshaft Chain Guide [B]
New O-rings [C]
Collar [D]
○Apply grease to the new O-ring.
● Tighten:

Torque - Front Camshaft Chain Guide Bolt (Upper) [E]: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Camshaft Chain Guide Bolt (Lower) [F]: 12 N·m (1.2 kgf·m, 106 in·lb)
Rear Camshaft Chain Guide Bolt [G]: 25 N·m (2.5 kgf·m, 18 ft·lb)

● Install the removed parts (see appropriate chapters).

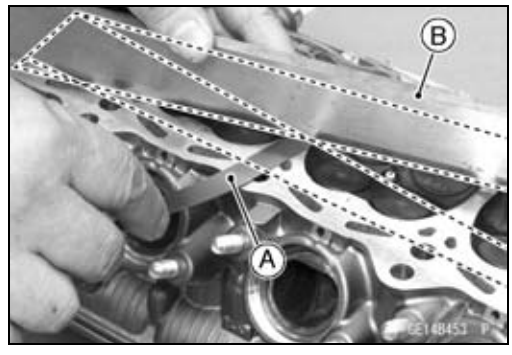


Cylinder Head Warp Inspection

● Clean the cylinder head.
● Lay a straightedge across the lower surface of the cylinder head at several positions.
● Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

Cylinder Head Warp
Standard: – – –
Service Limit: 0.05 mm (0.002 in.)

★If the cylinder head is warped more than the service limit, replace it.
★If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).



Valves

Valve Clearance Inspection

- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

Valve Clearance Adjustment

- Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

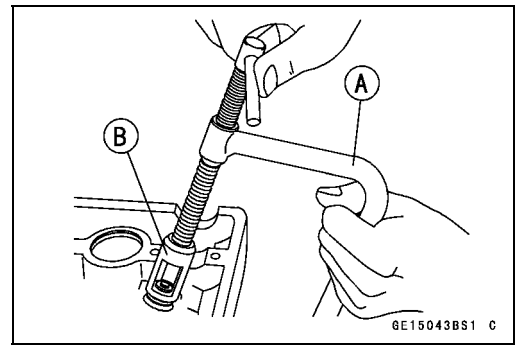
Valve Removal

- Remove:
  Cylinder Head (see Cylinder Head Removal)
  Valve Lifter and Shim

○Mark and record the valve lifter and shim locations so they can be installed in their original positions.

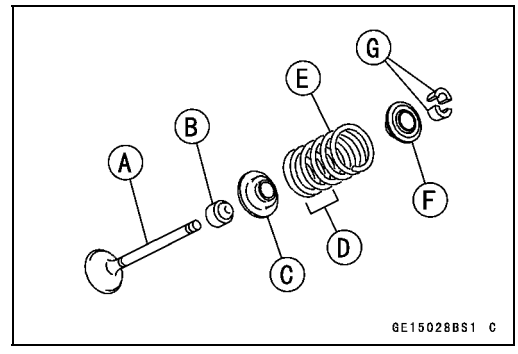
- Using the valve spring compressor assembly, remove the valve.

Special Tools - Valve Spring Compressor Assembly [A]: 57001-241
Valve Spring Compressor Adapter, ϕ24 [B]: 57001-1586



Valve Installation

- Replace the oil seal with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
- Install the springs so that the closed coil end faces downwards.
  Valve Stem [A]
  Oil Seal [B]
  Spring Seat [C]
  Closed Coil End [D]
  Valve Spring [E]
  Retainer [F]
  Split Keepers [G]



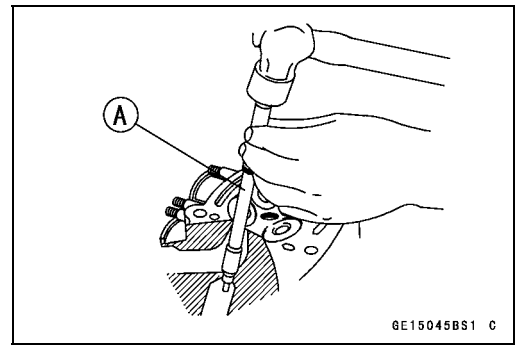
Valve Guide Removal

- Remove:
  Valve (see Valve Removal)
  Oil Seal
  Spring Seat
- Heat the area around the valve guide to 120 ~ 150°C (248 ~ 302°F), and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

NOTICE

Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head in oil and heat the oil.

Special Tool - Valve Guide Arbor, ϕ4.5: 57001-1331



Valves

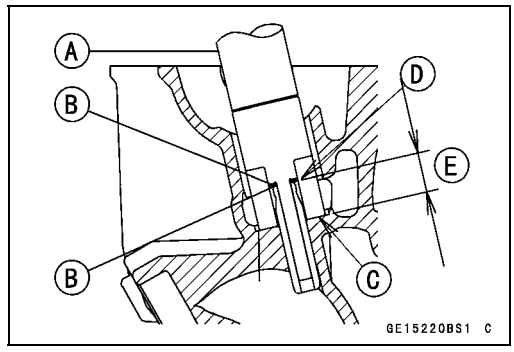
Valve Guide Installation

- Apply oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).

NOTICE
Do not heat the cylinder head with a torch. This Will warp the cylinder head. Soak the cylinder head and heat the oil.

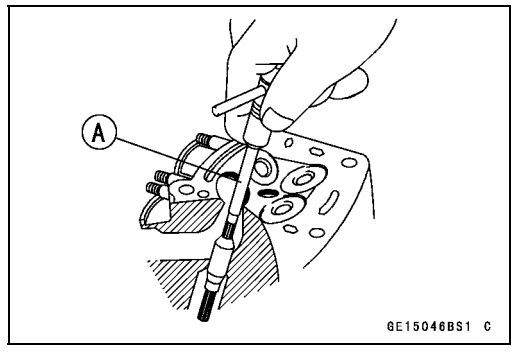
- Using the valve guide driver [A] and two washers [B], press and insert the valve guide in until the valve guide driver surface [C] touches the head surface [D].
  12.8 ~ 13.0 mm (0.504 ~ 0.512 in.) [E]

  Special Tools - Valve Guide Driver: 57001-1564
  Washer: 57001-1612



- Ream the valve guide with valve guide reamer [A], even if the old guide is reused.

  Special Tool - Valve Guide Reamer, ϕ4.5: 57001-1333



Valves

Valve-to-Guide Clearance Measurement (Wobble Method)

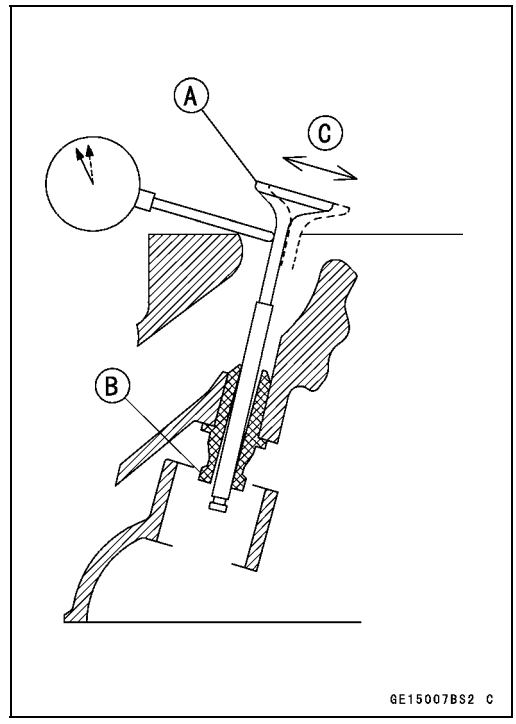
If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
- Move the stem back and forth [C] to measure valve/valve guide clearance.
- Repeat the measurement in a direction at a right angle to the first.

★If the reading exceeds the service limit, replace the guide.

NOTE

○*The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*



Valve/Valve Guide Clearance (Wobble Method)

Standard:

Exhaust	**0.09 ~ 0.16 mm (0.0035 ~ 0.0063 in.)**
Intake	**0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)**

Service Limit:

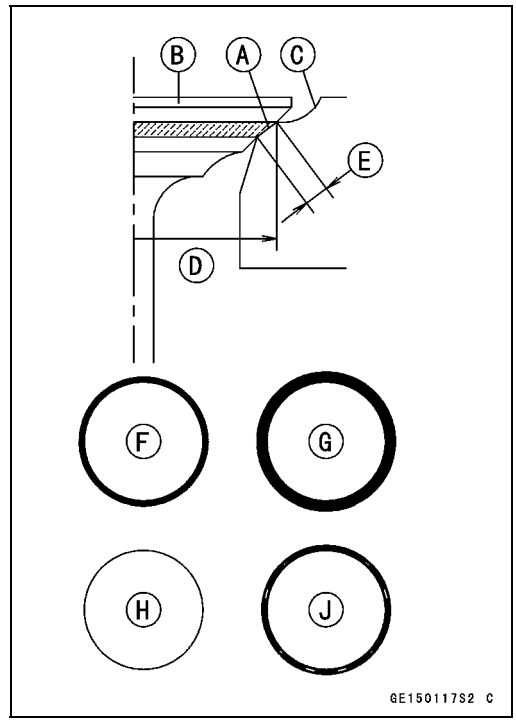
Exhaust	**0.36 mm (0.014 in.)**
Intake	**0.29 mm (0.011 in.)**

Valve Seat Inspection

- Remove the valve (see Valve Removal).
- Check the valve seating surface [A] between the valve [B] and valve seat [C].

○Measure the outside diameter [D] of the seating pattern on the valve seat.

★If the outside diameter is too large or too small, repair the seat (see Seat Repair).



Valve Seating Surface Outside Diameter

Standard:

Exhaust	**24.7 ~ 24.9 mm (0.972 ~ 0.980 in.)**
Intake	**28.9 ~ 29.1 mm (1.138 ~ 1.146 in.)**

○Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

Good [F]

★If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).

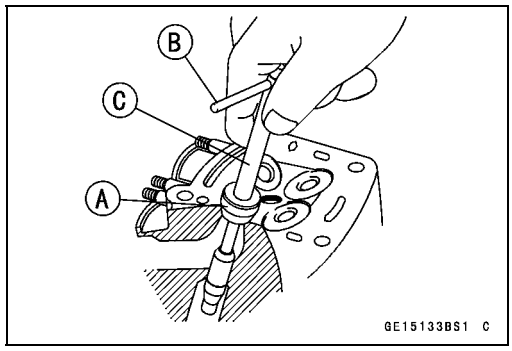
Valve Seating Surface Width

Standard:

Exhaust	**0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)**
Intake	**0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)**

Valves

Valve Seat Repair



● Repair the valve seat with the valve seat cutters [A].

Special Tools - Valve Seat Cutter Holder Bar [B]: 57001 -1128
Valve Seat Cutter Holder, ϕ4.5 [C]: 57001 -1330

[For Exhaust Valve Seat]
Valve Seat Cutter, 45° - ϕ27.5: 57001-1114
Valve Seat Cutter, 32° - ϕ28: 57001-1119
Valve Seat Cutter, 60° - ϕ27: 57001-1409

[For Intake Valve Seat]
Valve Seat Cutter, 45° - ϕ32: 57001-1115
Valve Seat Cutter, 32° - ϕ33: 57001-1199
Valve Seat Cutter, 60° - ϕ33: 57001-1334

★If the manufacturer's instructions are not available, use the following procedure.

Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

NOTE

○*Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

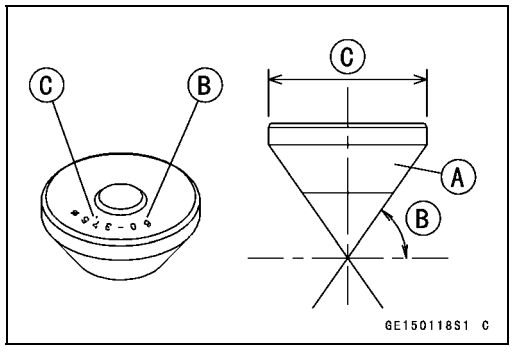
NOTE

○*Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter

The marks stamped on the back of the cutter [A] represent the following.
60° ..... Cutter angle [B]
37.5ϕ ..... Outer diameter of cutter [C]



Valves

Operating Procedures

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

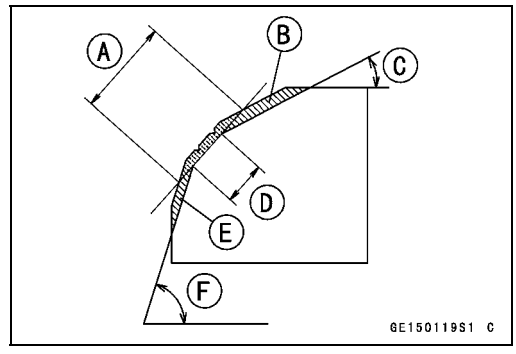
NOTICE

Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.

- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.

Widened Width [A] of engagement by machining with 45° cutter
Ground Volume [B] by 32° cutter
32° [C]
Correct Width [D]
Ground Volume [E] by 60° cutter
60° [F]



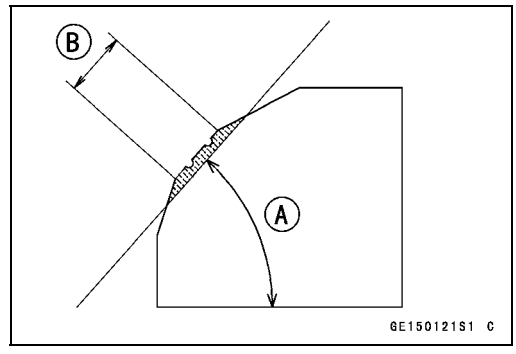
- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

Original Seating Surface [B]

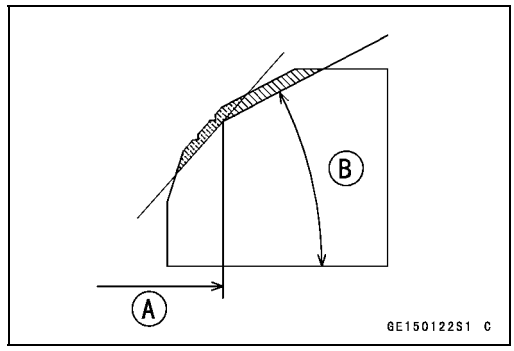
NOTE

○*Remove all pittings of flaws from 45° ground surface.*
○*After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.*
○*When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*



Valves

★If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.
★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.
● Grind the seat at a 32° angle [B] until the seat outside diameter is within the specified range.
○To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.
○Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

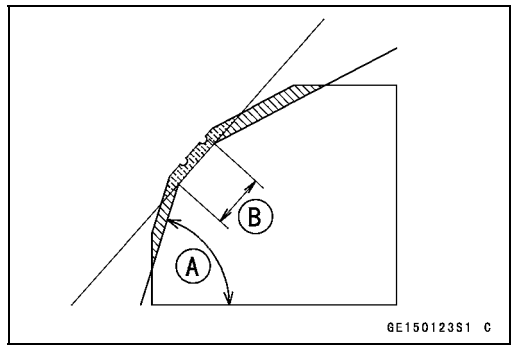


NOTICE

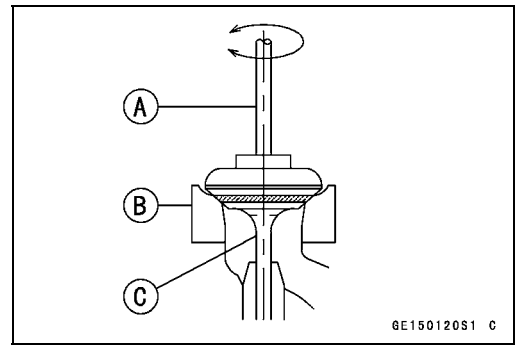
The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.

○After making the 32° grind, return to the seat outside diameter measurement step above.
● To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat outside diameter measurement step above.

★If the seat width is too wide, make the 60° [A] grind described below.
★If the seat width is within the specified range, lap the valve to the seat as described below.
● Grind the seat at a 60° angle until the seat width is within the specified range.
○To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
○Turn the holder, while pressing down lightly.
○After making the 60° grind, return to the seat width measurement step above.
Correct Width [B]



Valves



- Lap the valve to the seat, once the seat width and outside diameter are within the ranges specified above.

○Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.

○Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.

○Repeat the process with a fine grinding compound.

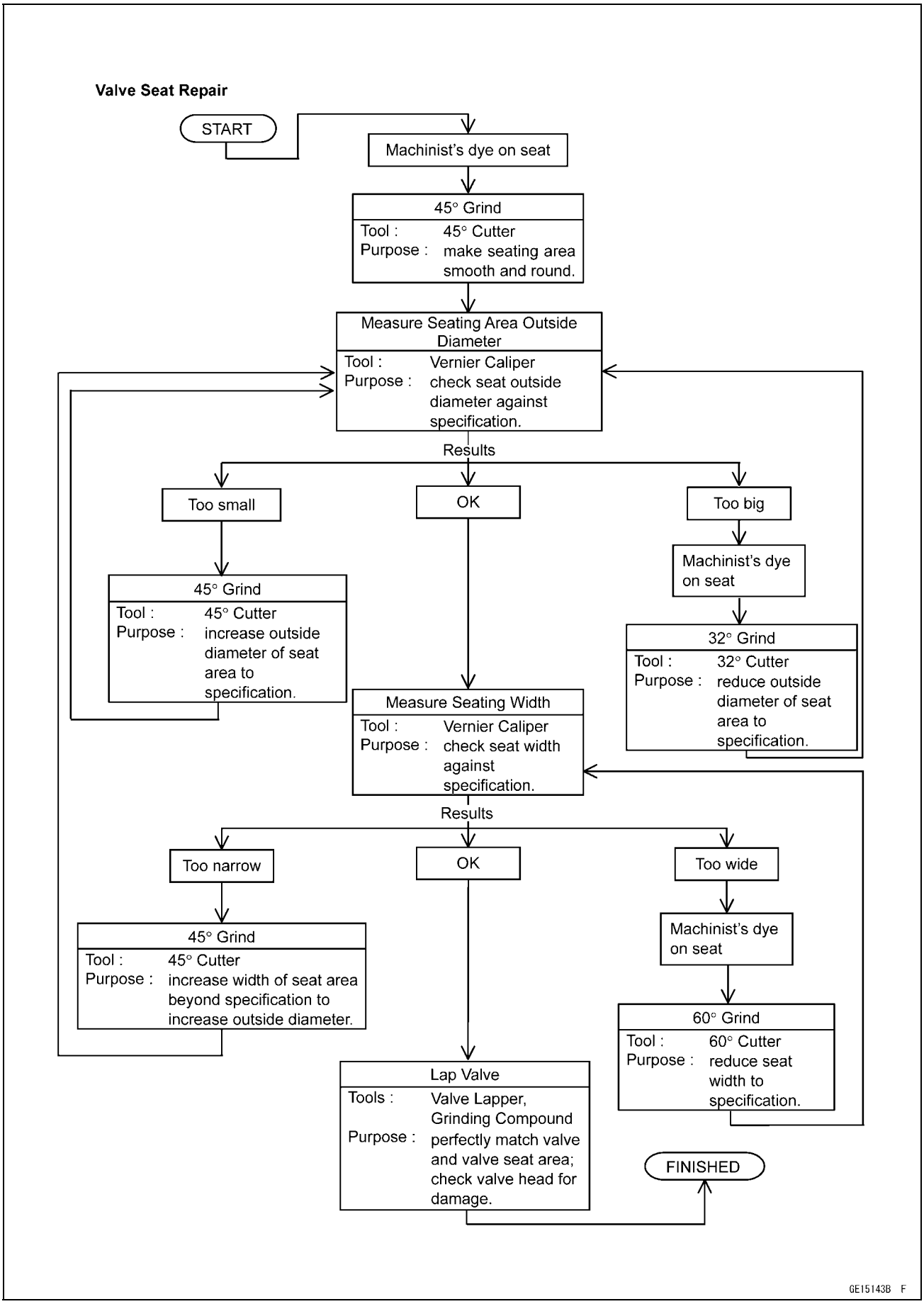
Lapper [A]
Valve Seat [B]
Valve [C]

- The seating area should be marked about in the middle of the valve face.

★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.

- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).

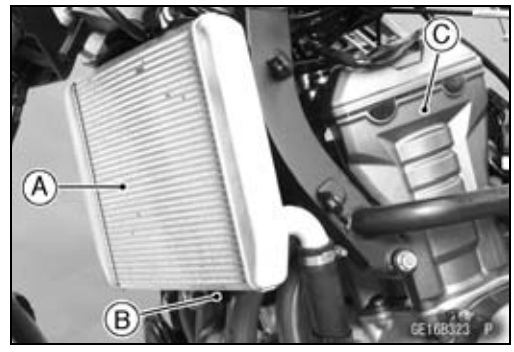
Valves


Valve Seat Repair
START
Machinist's dye on seat
45° Grind
Tool : 45° Cutter
Purpose : make seating area smooth and round.
Measure Seating Area Outside Diameter
Tool : Vernier Caliper
Purpose : check seat outside diameter against specification.
Results
Too small
OK
Too big
45° Grind
Tool : 45° Cutter
Purpose : increase outside diameter of seat area to specification.
Machinist's dye on seat
32° Grind
Tool : 32° Cutter
Purpose : reduce outside diameter of seat area to specification.
Measure Seating Width
Tool : Vernier Caliper
Purpose : check seat width against specification.
Results
Too narrow
OK
Too wide
45° Grind
Tool : 45° Cutter
Purpose : increase width of seat area beyond specification to increase outside diameter.
Machinist's dye on seat
60° Grind
Tool : 60° Cutter
Purpose : reduce seat width to specification.
Lap Valve
Tools : Valve Lapper, Grinding Compound
Purpose : perfectly match valve and valve seat area; check valve head for damage.
FINISHED
GE15143B F

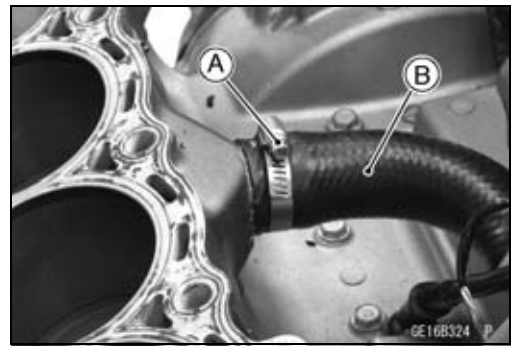
Cylinder, Pistons

Cylinder Removal

- Remove:
  Radiator [A] (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  Radiator Bracket [B]
  Cylinder Head [C] (see Cylinder Head Removal)
  Upper Engine Bracket (see Engine Removal in the Engine Removal/Installation chapter)



- Remove:
  Water Hose Clamp Screw (Loosen) [A]
  Water Hose [B]

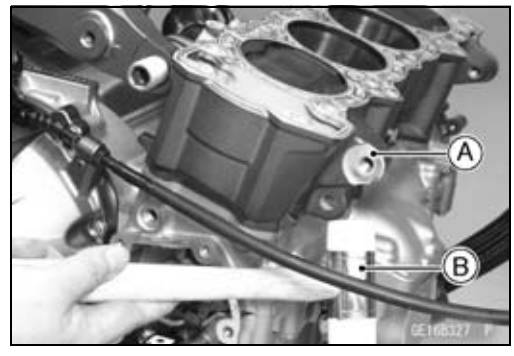


- Remove:
  Upper Engine Mounting Bolts (Left) [A]

- Remove:
  Cylinder [A]

NOTE

○*If it is hard to remove it, tap lightly using a plastic mallet [B].*

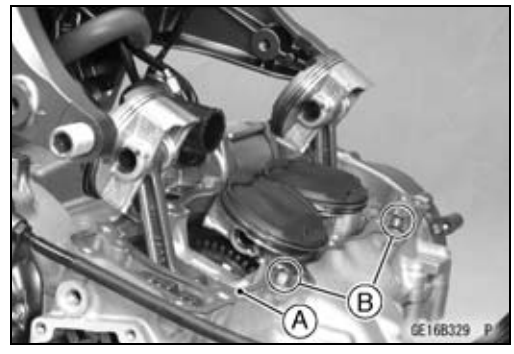


Cylinder Installation

NOTE

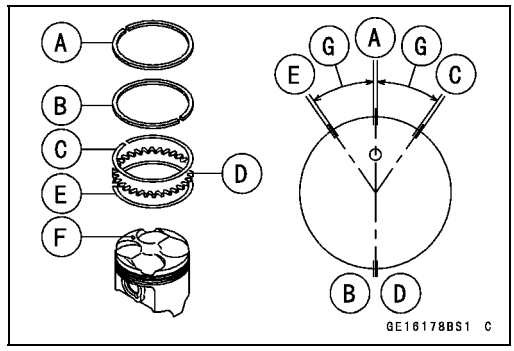
○*If a new cylinder is used, use new piston ring.*

- Replace the cylinder gasket [A] with a new one.
- Install the dowel pins [B] and new cylinder gasket.
- Apply molybdenum disulfide oil solution to the cylinder bore.

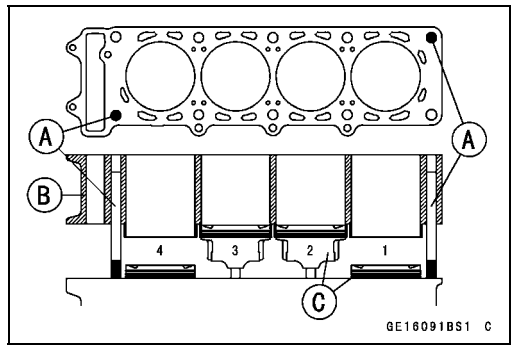


Cylinder, Pistons

● The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 ~ 40° of angle from the opening of the top ring.
Top Ring [A]
Second Ring [B]
Upper Oil Ring Steel Rail [C]
Oil Ring Expander [D]
Lower Oil Ring Steel Rail [E]
Dent [F]
30 ~ 40° [G]



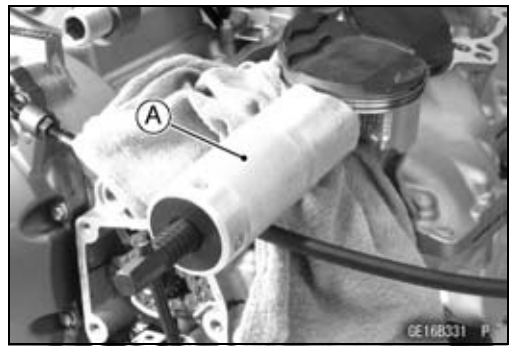
● Position the crankshaft at #2, 3 piston TDC.
● Prepare two auxiliary head bolts with their head cut.
○Install the two cylinder head bolts [A] diagonally in the crankcase.
● Install the cylinder block [B].
Pistons [C]
○First insert the #2, 3 pistons, and then rotate the crankshaft at 90° angle then insert the #1, 4 pistons.
● Tighten the upper engine mounting bolts and engine bracket bolts after cylinder head bolts tightend (see Cylinder Head Installation).



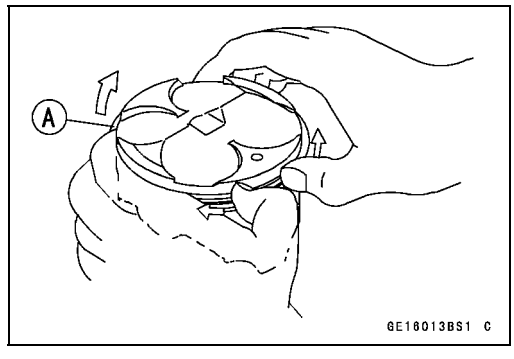
Piston Removal

● Remove the cylinder (see Cylinder Removal).
● Place a clean cloth under the pistons and remove the piston pin snap ring [A] from the outside of each piston.

● Remove the piston pins.
○If difficult to remove the piston pin, use the piston pin puller assembly [A] to remove the piston pin.
Special Tool - Piston Pin Puller Assembly [A]: 57001-910
● Remove the pistons.

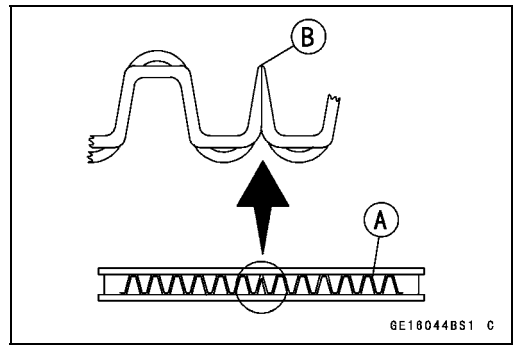


● Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
● Remove the 3-piece oil ring with your thumbs in the same manner.



Cylinder, Pistons

Piston Installation



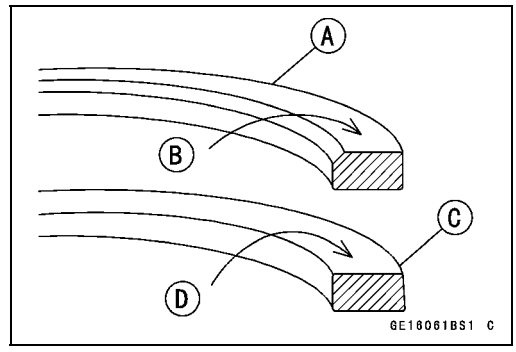
- Apply molybdenum disulfide oil solution to the oil ring expander, and install the oil ring expander [A] in the bottom piston ring groove so the ends [B] not butt together.
- Apply molybdenum disulfide oil solution to the oil ring steel rails, and install the oil ring steel rails, one above the expander and one below it.

○Spread the rail with your thumbs, but only enough to fit the rail over the piston.

○Release the rail into the bottom piston ring groove.

NOTE

○*The oil ring rails have no "top" or "bottom".*



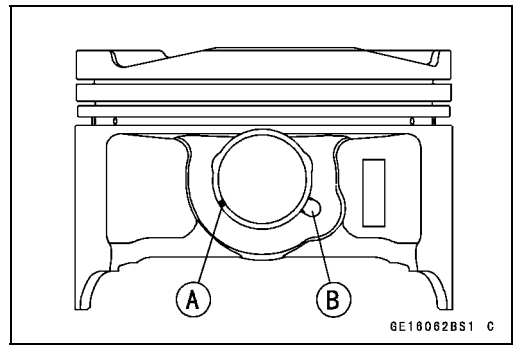
- Do not mix up the top and second ring.
- Install the top ring [A] so that the "1T" mark [B] faces up.
- Install the second ring [C] so that the "2T" mark [D] faces up.

○Apply molybdenum disulfide oil solution to the piston rings.

NOTE

○*If a new piston is used, use new piston ring.*

- Install the piston with its dent mark facing forward.



- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.

○Apply molybdenum disulfide oil solution to the piston pins and piston journals.

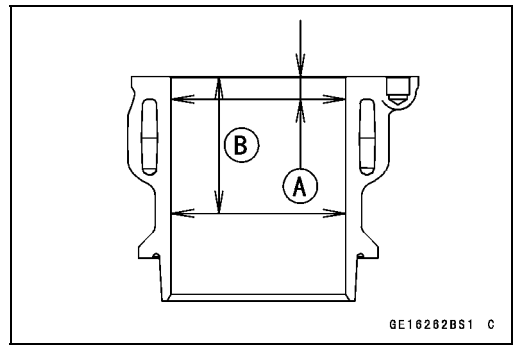
○When installing the piston pin snap ring, compress it only enough to install it and no more.

NOTICE

Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.

- Install the cylinder (see Cylinder Installation).

Cylinder Wear Inspection



- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) as shown in the figure.

★If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.

10 mm (0.39 in.) [A]
60 mm (2.36 in.) [B]

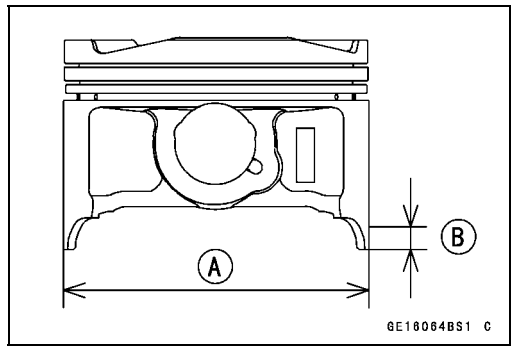
Cylinder Inside Diameter

Standard: 76.990 ~ 77.006 mm (3.0311 ~ 3.0317 in.)

Service Limit: 77.09 mm (3.035 in.)

Cylinder, Pistons

Piston Wear Inspection



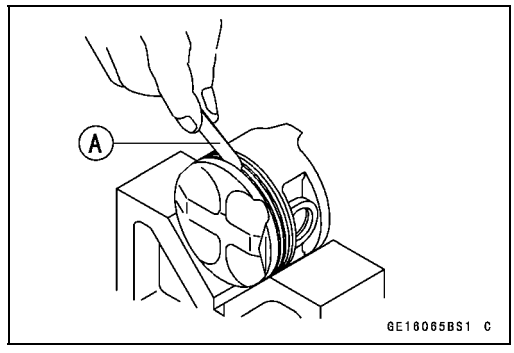
- Measure the outside diameter [A] of each piston 11 mm (0.43 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

★If the measurement is under service limit, replace the piston.

Piston Diameter

Standard:	**76.974 ~ 76.984 mm (3.0305 ~ 3.0309 in.)**
Service Limit:	**76.82 mm (3.024 in.)**

Piston Ring, Piston Ring Groove Wear Inspection



- Check for uneven groove wear by inspecting the ring seating.

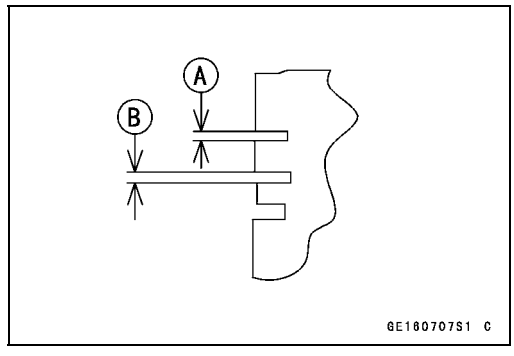
★The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

Piston Ring/Groove Clearance

Standard:	
Top	**0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)**
Second	**0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)**
Service Limit:	
Top	**0.17 mm (0.0067 in.)**
Second	**0.16 mm (0.0063 in.)**

Piston Ring Groove Width Inspection



- Measure the piston ring groove width.

○Use a vernier caliper at several points around the piston.

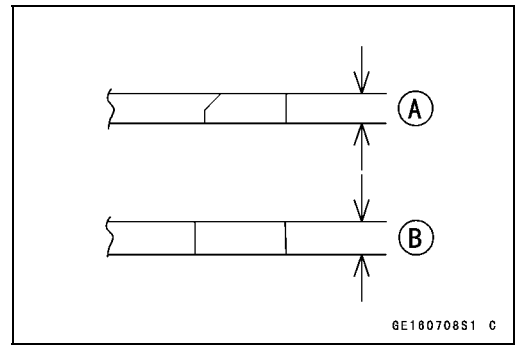
Piston Ring Groove Width

Standard:	
Top [A]	**0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)**
Second [B]	**0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)**
Service Limit:	
Top [A]	**0.92 mm (0.0362 in.)**
Second [B]	**0.91 mm (0.0358 in.)**

★If the width of any of the two grooves are wider than the service limit at any point, replace the piston.

Cylinder, Pistons

Piston Ring Thickness Inspection



● Measure the piston ring thickness.

○Use the micrometer to measure at several points around the ring.

Piston Ring Thickness

Standard:

Top [A]	**0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)**
Second [B]	**0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)**

Service Limit:

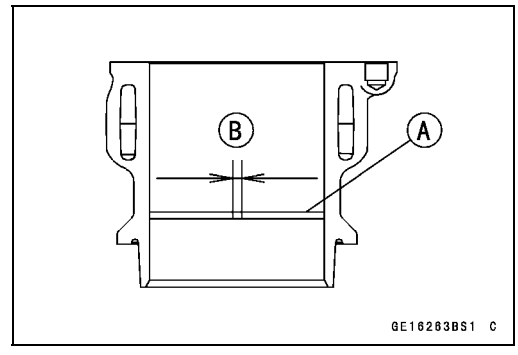
Top [A]	**0.70 mm (0.028 in.)**
Second [B]	**0.70 mm (0.028 in.)**

★If any of the measurements is less than the service limit on either of the rings, replace all the rings.

NOTE

○*When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.*

Piston Ring End Gap Inspection



● Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.

● Measure the gap [B] between the ends of the ring with a thickness gauge.

Piston Ring End Gap

Standard:

Top	**0.20 ~ 0.30 mm (0.0079 ~ 0.0118 in.)**
Second	**0.38 ~ 0.48 mm (0.0150 ~ 0.0189 in.)**

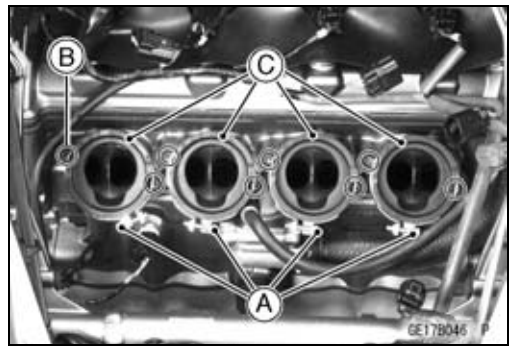
Service Limit:

Top	**0.6 mm (0.024 in.)**
Second	**0.8 mm (0.031 in.)**

★If the end gap of either ring is greater than the service limit, replace all the rings.

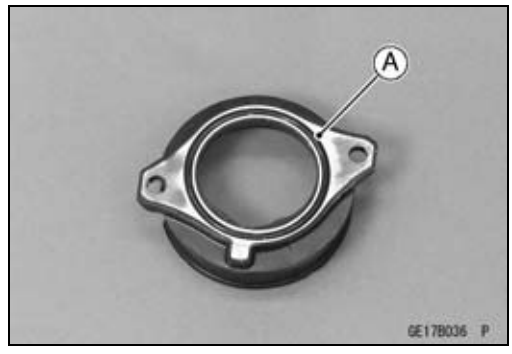
Throttle Body Assy Holder

Throttle Body Assy Holder Removal



- Remove:
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Clamps [A]
  Bolts [B]
  Throttle Body Assy Holders [C]

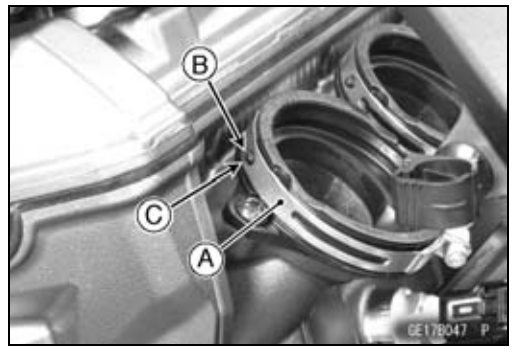
Throttle Body Assy Holder Installation



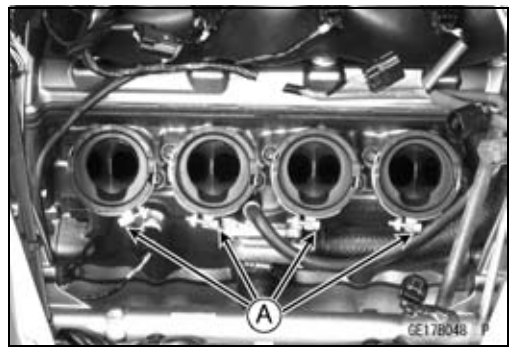
- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings, and install them.
- Apply a non-parmanent locking agent to the throttle body assy holder bolts.
- Tighten:

Torque - Throttle Body Assy Holder Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Install the clamps [A] so that their projections [B] fit on the holes [C] of the holders.



○Be sure that the clamp bolt heads [A] face as shown in the figure.



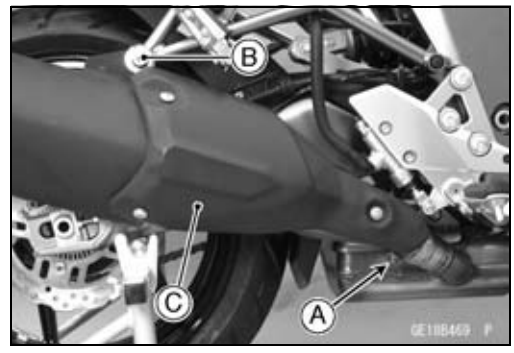
Muffler

⚠ WARNING

The exhaust pipe or muffler body can become extremely hot during normal operation and cause severe burns. Do not remove the exhaust pipe or muffler body while it is hot.

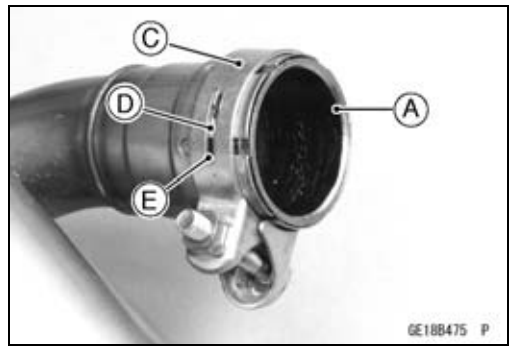
Muffler Body Removal

- Remove:
  Muffler Body Clamp Bolt [A] (Loosen)
  Muffler Body Mounting Bolt [B] and Nut
  Muffler Body [C]



Muffler

Muffler Body Installation

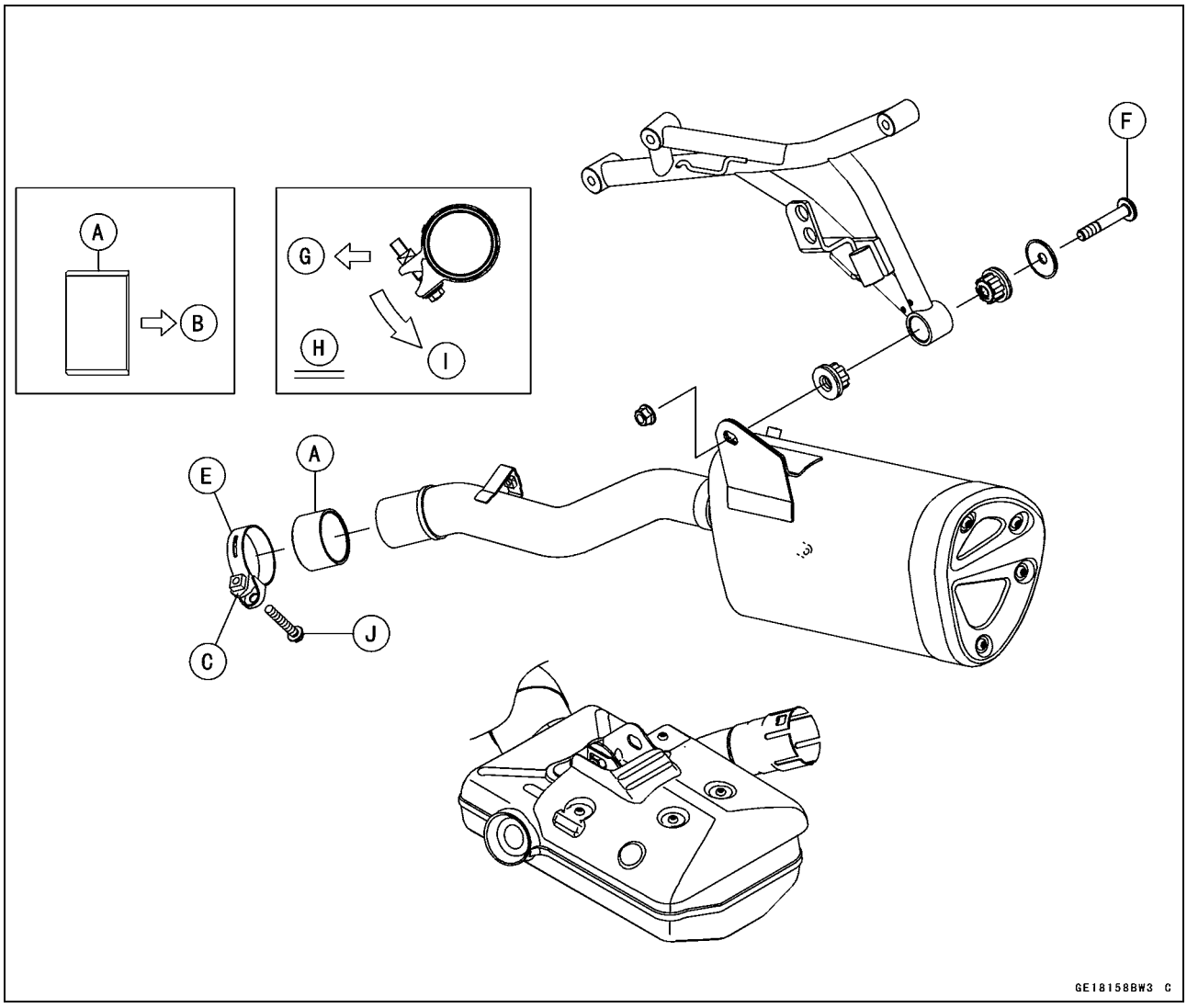


- Replace the muffler body gaskets [A] with new ones.
- Install the muffler body gaskets until it is bottomed so that the inside chamfer side faces rear [B].
- Install the muffler body clamp [C] so that the insert the projection [D] into the clamp slit [E].
- Install the muffler body until it stops at the bottom surface of the exhaust pipe.
- Install the muffler body mounting bolt and nut.
- Tighten:

Torque - Muffler Body Mounting Bolt [F]: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Turn the muffler body clamp outward until it stops at the slit ends.
  Inside [G]
  Viewed from Rear [H]
  Outward [I]
- Tighten:

Torque - Muffler Body Clamp Bolt [J]: 21 N·m (2.1 kgf·m, 15 ft·lb)

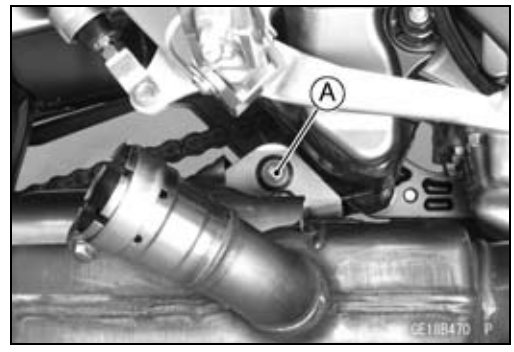


- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.
- Install the removed parts (see appropriate chapters).

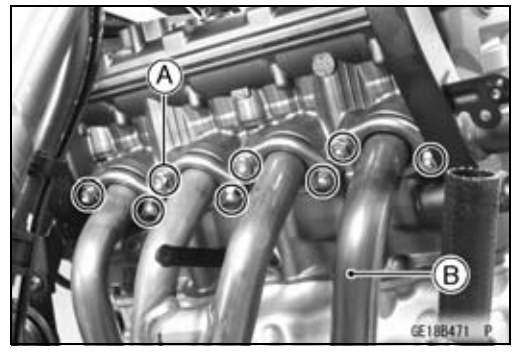
Muffler

Exhaust Pipe Removal

- Remove:
  Muffler Body (see Muffler Body Removal)
  Oxygen Sensor (see Oxygen Sensor Removal in the Electrical System chapter)
- Support the premuffler chamber with the suitable stand.
- Loosen the premuffler chamber mounting bolt [A].



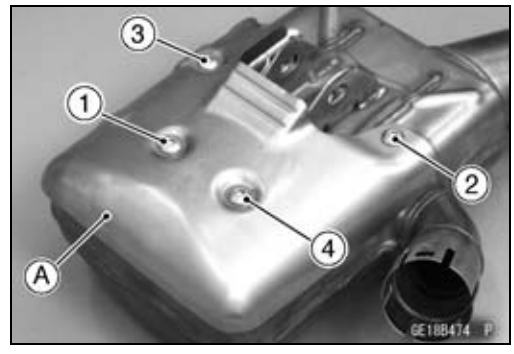
- Remove:
  Exhaust Pipe Holder Nuts [A]
  Exhaust Pipe (Premuffler Chamber) [B]
  (In the photo, the radiator has been removed for clarity)



Exhaust Pipe Installation

- If the premuffler chamber guard [A] has been removed, install it and tighten the bolts in sequence [1 ~ 4] as shown in the figure.

  Torque - Premuffler Chamber Guard Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

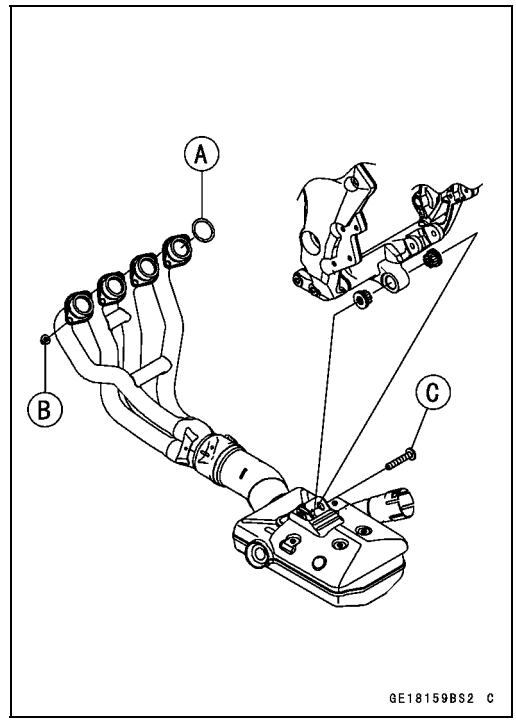


- Replace the exhaust pipe gaskets [A] with new ones and install them.
- Install the exhaust pipe.
- Tighten the exhaust pipe holder nuts [B] and mounting bolt [C].

  Torque - Premuffler Chamber Mounting Bolt [C]: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Install the muffler body (see Muffler Body Installation).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.
- Install the removed parts (see appropriate chapters).

○When installing, run the cables and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



Clutch

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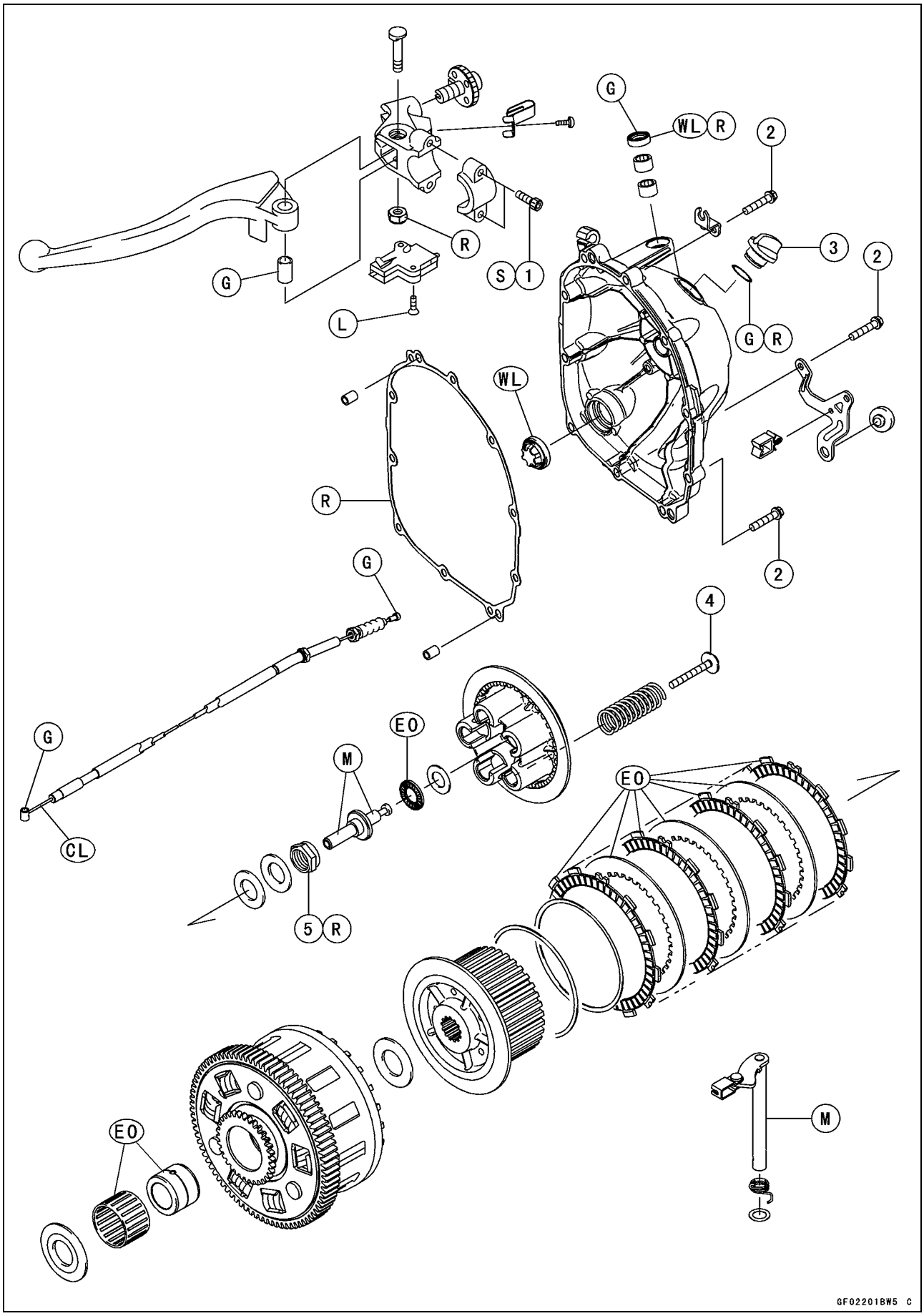
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Lever Assembly Clamp Bolts	7.8	0.80	69 in·lb	S
2	Clutch Cover Bolts	9.8	1.0	87 in·lb	
3	Oil Filler Plug	–	–	–	Hand-tighten
4	Clutch Spring Bolts	9.0	0.92	80 in·lb	
5	Clutch Hub Nut	135	13.8	100	R

CL: Apply cable lubricant.
EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
S: Follow the specified tightening sequence.
WL: Apply soap and water solution or rubber lubricant.

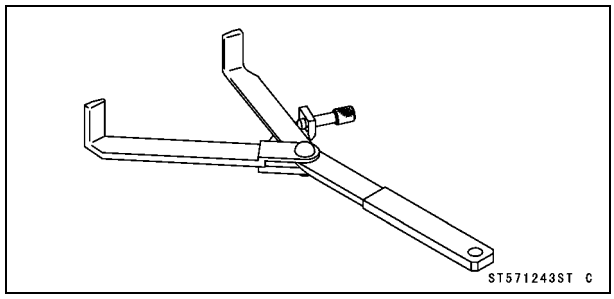
6-4 CLUTCH

Specifications

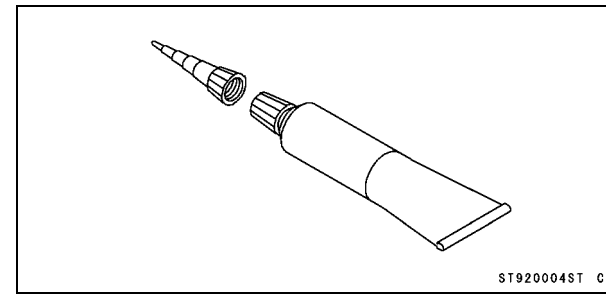
Item	Standard	Service Limit
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Clutch		
Clutch Plate Assembly Length	51.1 ~ 51.7 mm (2.01 ~ 2.04 in.)	– – –
Friction Plate Thickness	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)	2.4 mm (0.094 in.)
Friction and Steel Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.012 in.)
Clutch Spring Free Length	64.6 mm (2.54 in.)	61.6 mm (2.43 in.)

Special Tool and Sealant

Clutch Holder:
57001-1243



Liquid Gasket, TB1211F:
92104-0004



Clutch Lever and Cable

Clutch Lever Free Play Inspection

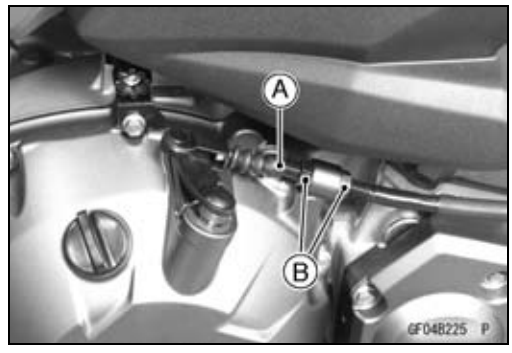
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

Clutch Lever Free Play Adjustment

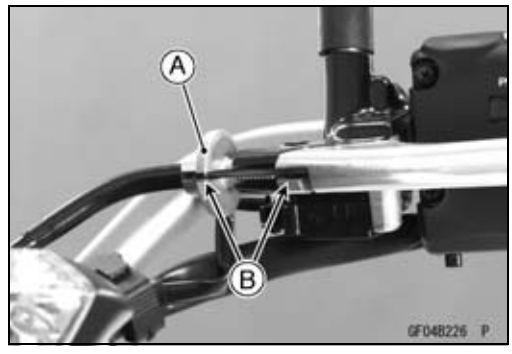
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

Clutch Cable Removal

- Remove the right radiator side cover (see Radiator and Radiator Fan Removal in the Cooling System chapter).
- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen the nuts [B], and slide the lower end of the clutch cable to give the cable plenty of play.



- Screw in the adjuster [A].
- Line up the slots [B] in the clutch lever and adjuster, and then free the cable from the lever.
- Free the clutch inner cable tip from the clutch release lever.
- Pull the clutch cable out of the frame.



Clutch Cable Installation

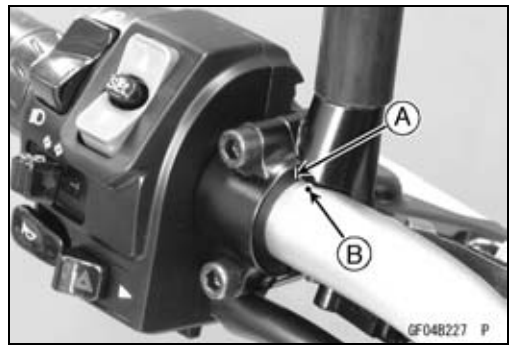
- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).

Clutch Cable Lubrication

- Refer to the Chassis Parts Lubrication in the Periodic Maintenance chapter.

Clutch Lever Assembly Installation

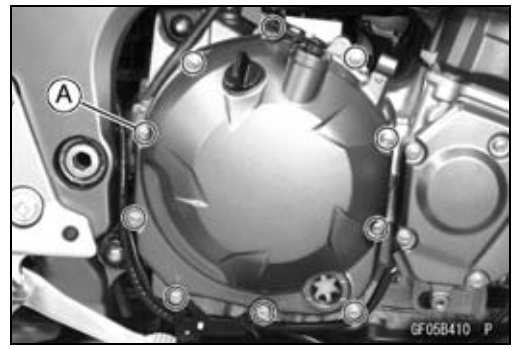
- Install the clutch lever so that the mating surface [A] of the clutch lever clamp is aligned with the punch mark [B].
- Tighten the upper clamp bolt first, and then the lower clamp bolt. There will be a gap at the lower part of the clamp after tightening.



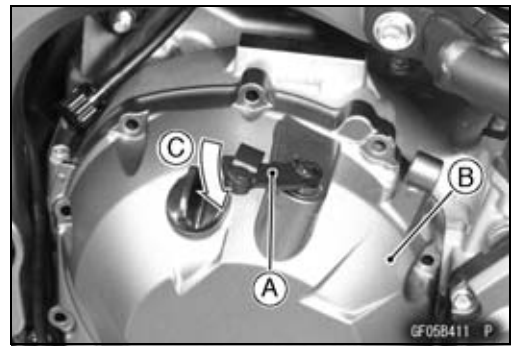
Clutch Cover

Clutch Cover Removal

- Remove:
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  Clutch Cable Lower End
  Clutch Cover Mounting Bolts [A]



- Turn the release lever [A] toward the rear as shown in the figure, and remove the clutch cover [B].
  About 90° [C]



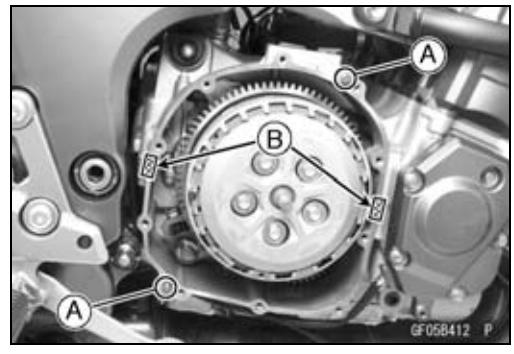
Clutch Cover Installation

- Be sure to dowel pins [A].
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply silicone sealant to the area [B] where the mating surface of the crankcase touches the clutch cover gasket.

  Sealant - Liquid Gasket, TB1211F: 92104-0004

- Replace the clutch cover gasket with a new one and install it.
- Tighten:

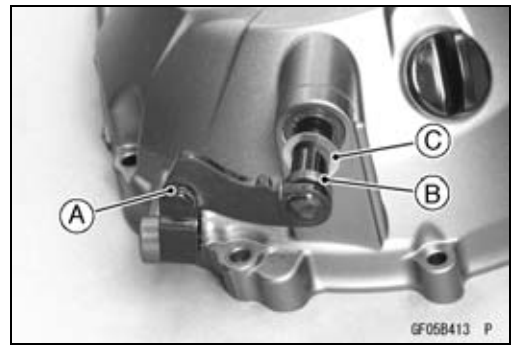
  Torque - Clutch Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Release Shaft Removal

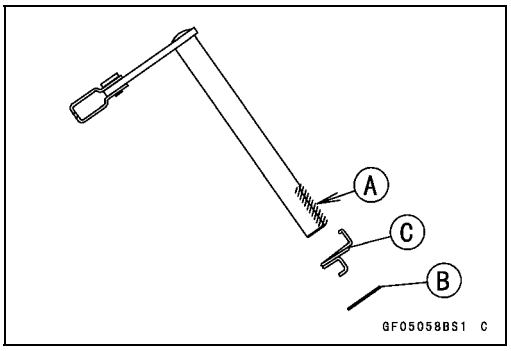
NOTICE
Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.

- Remove the clutch cover (see Clutch Cover Removal).
- Pull the release lever and shaft assembly [A] straight out of the clutch cover.
- Remove the spring [B] and washer [C].



Clutch Cover

Release Shaft Installation

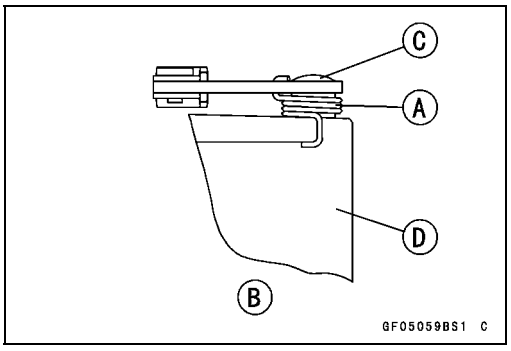


- Apply grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearings in the hole of the clutch cover.
- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Install the washer [B] and spring [C].
- Insert the release shaft straight into the upper hole of the clutch cover.

NOTICE

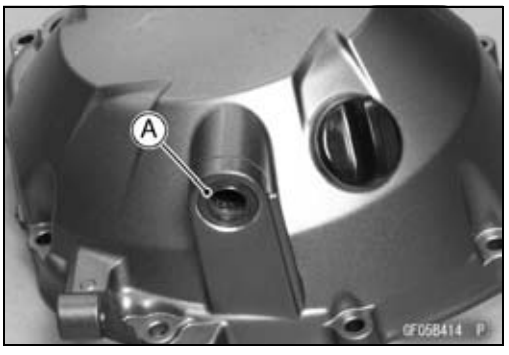
When inserting the release shaft, be careful not to remove the spring of the oil seal.

- Fit the spring [A] as shown in the figure.
  Viewed from Rear [B]
  Release Shaft [C]
  Clutch Cover [D]

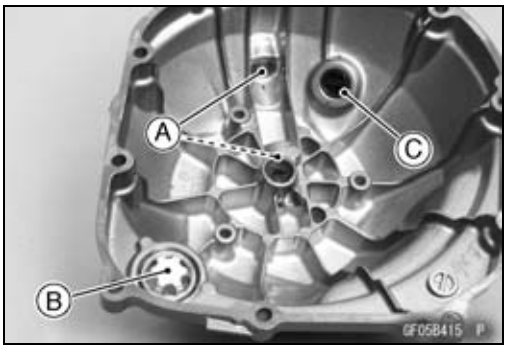


Clutch Cover Disassembly

- Remove:
  Clutch Cover (see Clutch Cover Removal)
  Release Lever and Shaft Assembly (see Release Shaft Removal)
  Oil Seal [A]



- Remove:
  Needle Bearings [A]
  Oil Level Inspection Window [B]
  Oil Filler Plug [C]



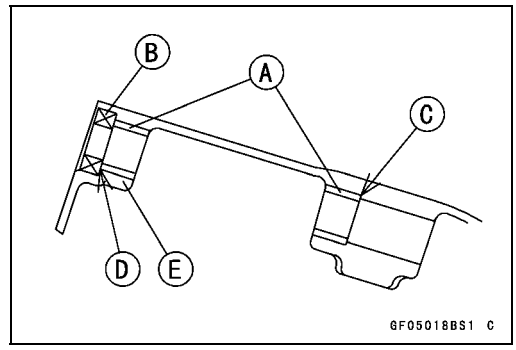
Clutch Cover

Clutch Cover Assembly

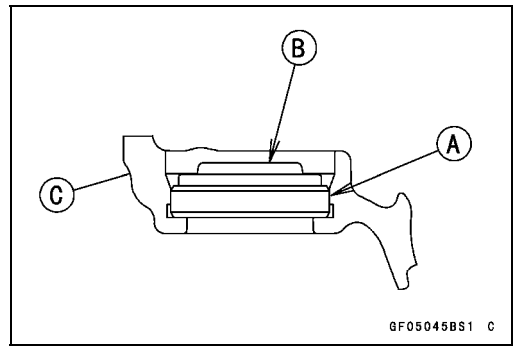
- Replace the needle bearings and oil seal with new ones.

NOTE

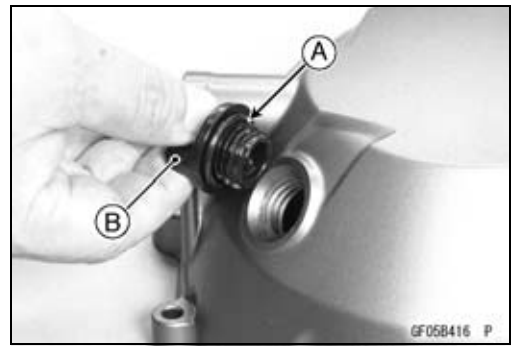
○*Install the needle bearings so that the manufacture's mark face out.*



- Install the needle bearings [A] and oil seal [B] position as shown in the figure.
  Press the needle bearing until the bottom [C].
  Press the needle bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].
  Apply a soapy water to outside of the oil seal and press it until the bottom.



- Apply a soapy water to the rubber portion [A] of the oil level inspection window.
- Press the gauge until the bottom so that its projection [B] faces inside of the clutch cover [C].

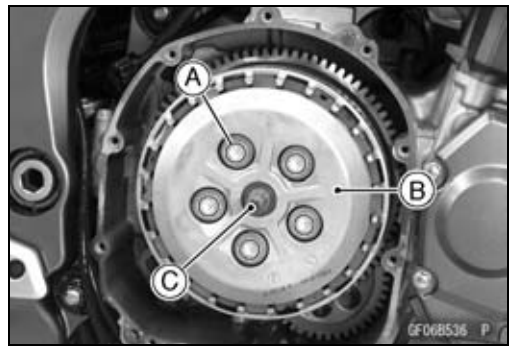


- Replace the O-ring [A] of the oil filler plug [B] with a new one.
- Apply grease to the O-ring.
- Tighten:

Torque - Oil Filler Plug: Hand-tighten

Clutch

Clutch Removal



- Remove:
  Clutch Cover (see Clutch Cover Removal)
  Clutch Spring Bolts [A]
  Clutch Springs
  Clutch Spring Plate [B] (with Washer, Needle Bearing and Pusher [C])
- Remove:
  Friction Plates and Steel Plates
  Spring and Spring Seat

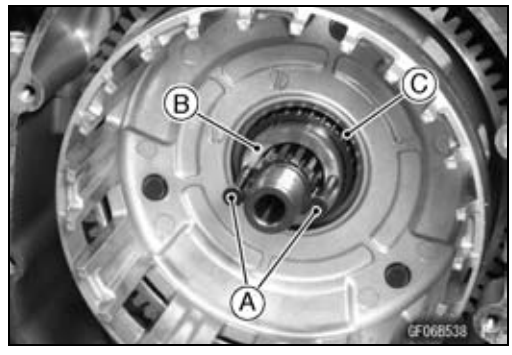
NOTE

○*The two plates at both ends are different from the plate installed between these plates.*
However, it is impossible to identify it on externals.
○*Mark and record the locations of the friction plates so that they can be reinstalled in their original positions.*

- Holding the clutch hub [A], remove the nut [B] and washers.

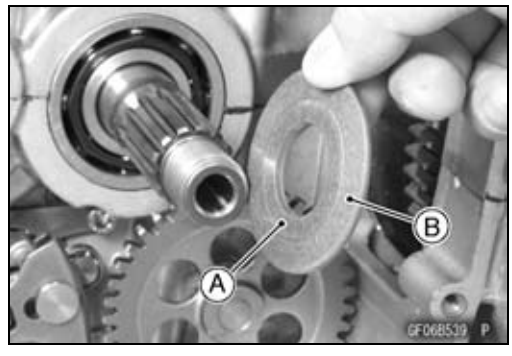
Special Tool - Clutch Holder [C]: 57001-1243

- Remove:
  Clutch Hub
  Spacer (ϕ47 × ϕ25.5)



- Using the two M4 bolts or screws [A], pull out the sleeve [B], and then remove the needle bearing [C] and clutch housing.
- Remove the spacer (ϕ56 × ϕ25).

Clutch Installation

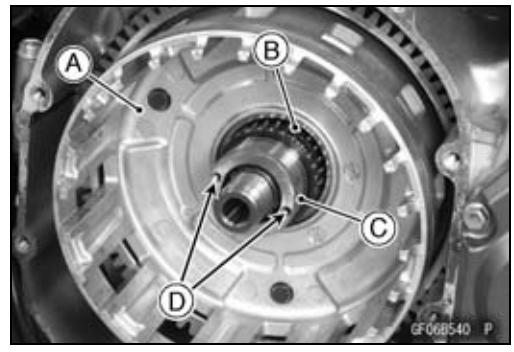


- Install the spacer (ϕ56 × ϕ25) [A] so that the tapered side [B] faces inward.

Clutch

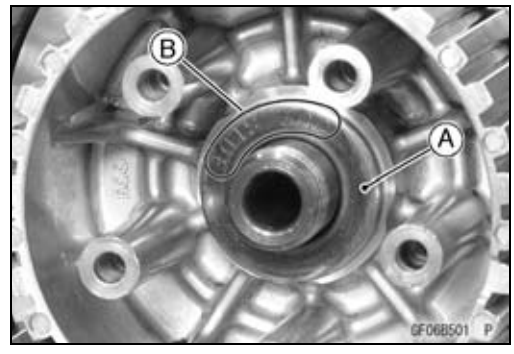
- Install the clutch housing [A] to the drive shaft.
- While holding the clutch housing, install the needle bearing [B] and sleeve [C].

○The holes [D] of the sleeve face outward.



- Install the following parts to the drive shaft.
  Spacer (ϕ47 × ϕ25.5) [A]
  Clutch Hub

- Install the washer [A] so that the “OUTSIDE” mark [B] faces outward.

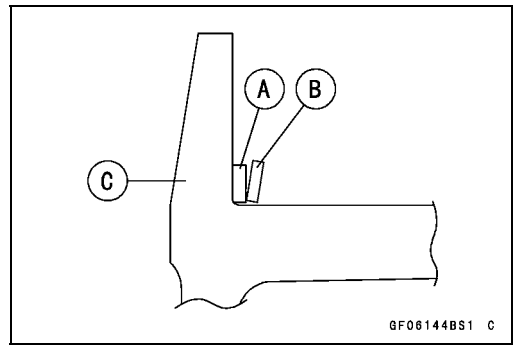


- Replace the clutch hub nut with a new one.
- Holding the clutch hub, tighten the clutch hub nut.

Special Tool - Clutch Holder: 57001-1243

Torque - Clutch Hub Nut: 135 N·m (13.8 kgf·m, 100 ft·lb)

- Install the spring seat [A] and spring [B] as shown in the figure.
  Clutch Hub [C]



Clutch

● Install the friction plates and steel plates, starting with a friction plate and alternating them.

NOTE

○*Install the both ends marked two friction plates at disassembled to the their original position.*

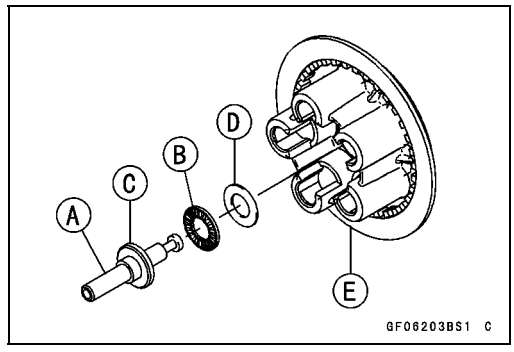
○*When replace the friction plates with new ones, mark the both ends two friction plates so that the two kinds of friction plates do not mix up at opening the package.*

NOTICE

If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.

○Install the last friction plate [A] fitting the tangs in the grooves in the housing as shown in the figure.

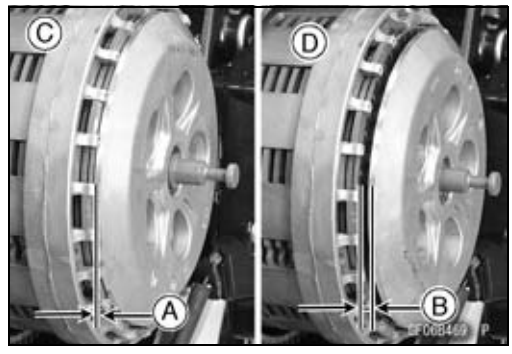
● Apply molybdenum disulfide grease to the pusher shaft [A].
● Apply engine oil to the needle bearing [B].
● Install the pusher [C], needle bearing and washer [D] in the clutch spring plate [E].



● Install the clutch spring plate so that there are no gap [A].
★If it has gap [B], turn the clutch spring plate to install it again.
[C] Correct
[D] Wrong
● Install:
Clutch Springs
● Tighten:

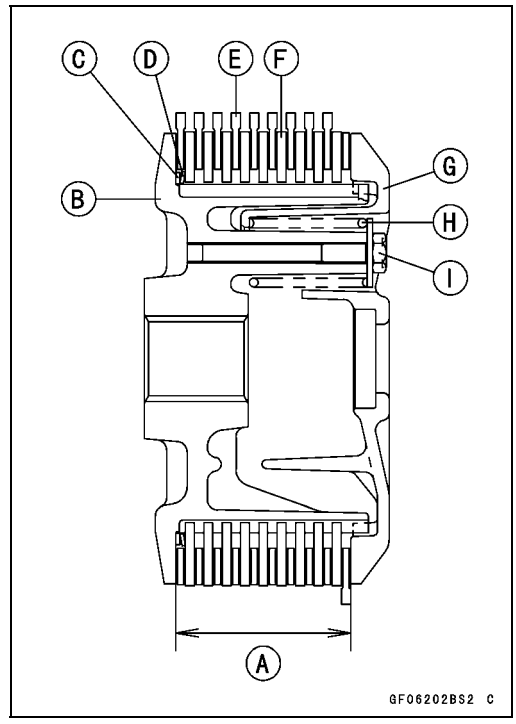
Torque - Clutch Spring Bolts: 9.0 N·m (0.92 kgf·m, 80 in·lb)

● Install the clutch cover (see Clutch Cover Installation).



Clutch

Clutch Plate Assembly Inspection



- Inspect the friction plate thickness (see Clutch Plate, Wear, Damage Inspection).
- Measure the length [A] of the clutch plate assembly as shown in the figure.

○Assemble:
Clutch Hub [B]
Spring Seat [C]
Spring [D]
Friction Plates [E]
Steel Plates [F]
Clutch Spring Plate [G]
Clutch Springs [H]
Clutch Spring Bolts [I]

NOTE

○*Install the both ends marked two friction plates at disassembled to the their original position.*

Torque - Clutch Spring Bolts: 9.0 N·m (0.92 kgf·m, 80 in·lb)

Clutch Plate Assembly Length
Standard: 51.1 ~ 51.7 mm (2.01 ~ 2.04 in.)

★If the length is not within the specified range, adjust the length (see Clutch Plate Assembly Adjustment).

Clutch Plate Assembly Adjustment

- Inspect the clutch plate assembly length, and then replace the steel plate(s) which brings the length within the specified range.
- Remove:
  Clutch Spring Bolts
  Clutch Springs
  Clutch Spring Plate
- Replace the following steel plate(s).

Thickness	Part Number
2.3 mm (0.091 in.)	13089-0008
2.6 mm (0.102 in.)	13089-0009
2.9 mm (0.114 in.)	13089-1093

NOTE

○*Do not use the steel plate of 2.3 mm (0.091 in.) and 2.9 mm (0.114 in.) thickness at the same time.*

- Install the removed parts, and inspect the clutch plate assembly length.

Torque - Clutch Spring Bolts: 9.0 N·m (0.92 kgf·m, 80 in·lb)

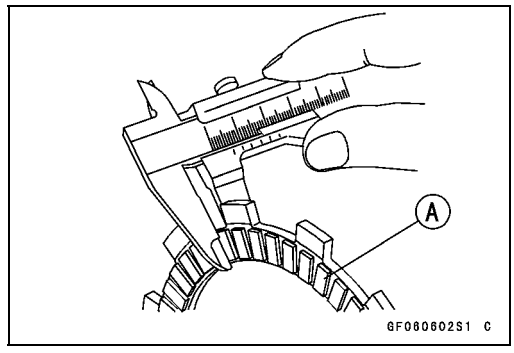
Clutch

Clutch Plate, Wear, Damage Inspection

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.

★If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

Friction Plate Thickness
Standard: 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)
Service Limit: 2.4 mm (0.094 in.)

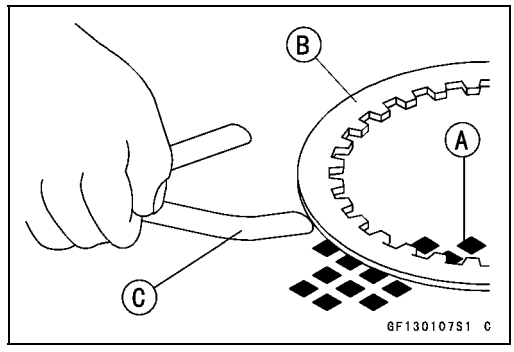


Clutch Plate Warp Inspection

- Place each friction plate or steel plate on a surface plate and measure the gap between the surface plate [A] and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp.

★If any plate is warped over the service limit, replace it with a new one.

Friction and Steel Plate Warp
Standard: 0.15 mm (0.0059 in.) or less
Service Limit: 0.3 mm (0.012 in.)

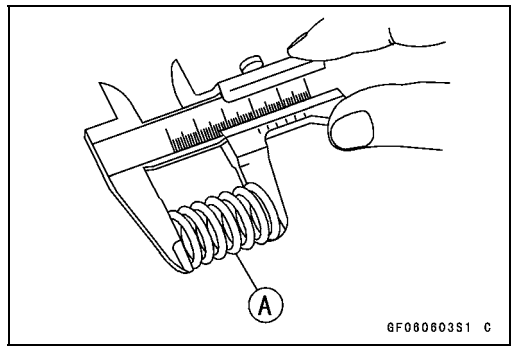


Clutch Spring Free Length Measurement

- Measure the free length of the clutch springs [A].

★If any spring is shorter than the service limit, it must be replaced.

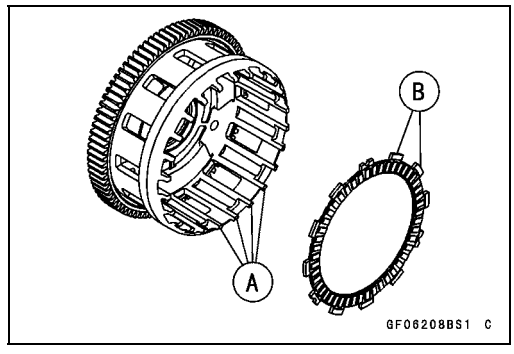
Clutch Spring Free Length
Standard: 64.6 mm (2.54 in.)
Service Limit: 61.6 mm (2.43 in.)



Clutch Housing Finger Inspection

- Visually inspect the clutch housing fingers [A] where the friction plate tangs [B] hit them.

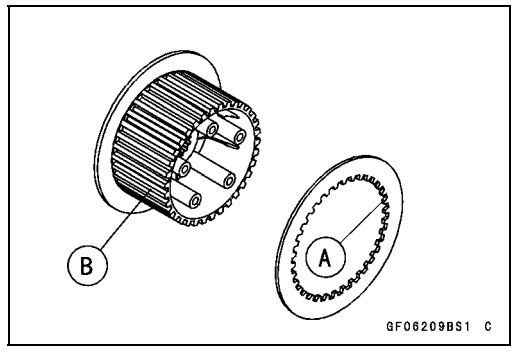
★If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.



Clutch Housing Spline Inspection

- Visually inspect where the teeth [A] on the steel plates wear against the clutch hub splines [B].

★If there are notches worn into the splines, replace the clutch hub. Also, replace the steel plates if their teeth are damaged.



Engine Lubrication System

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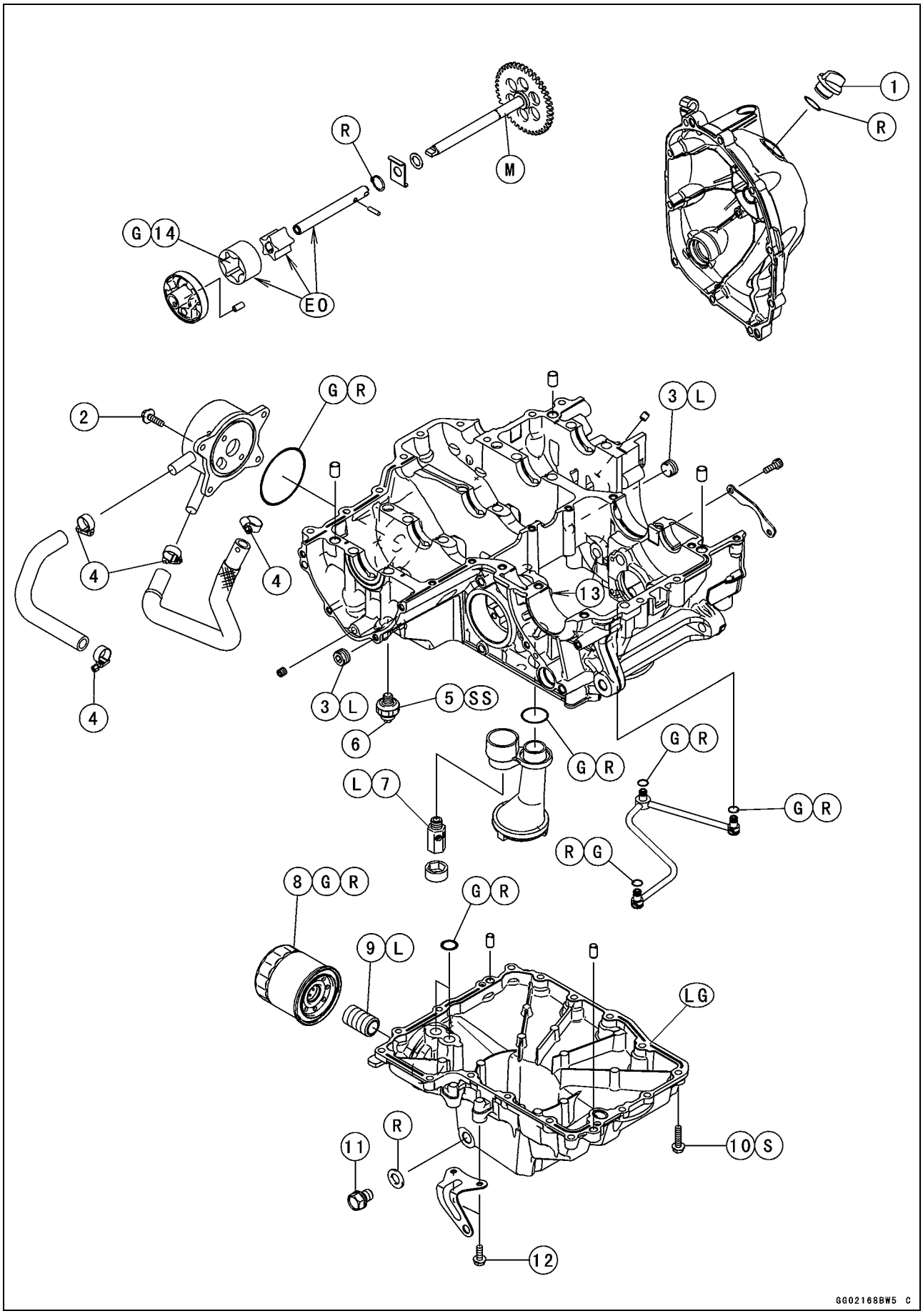
Exploded View



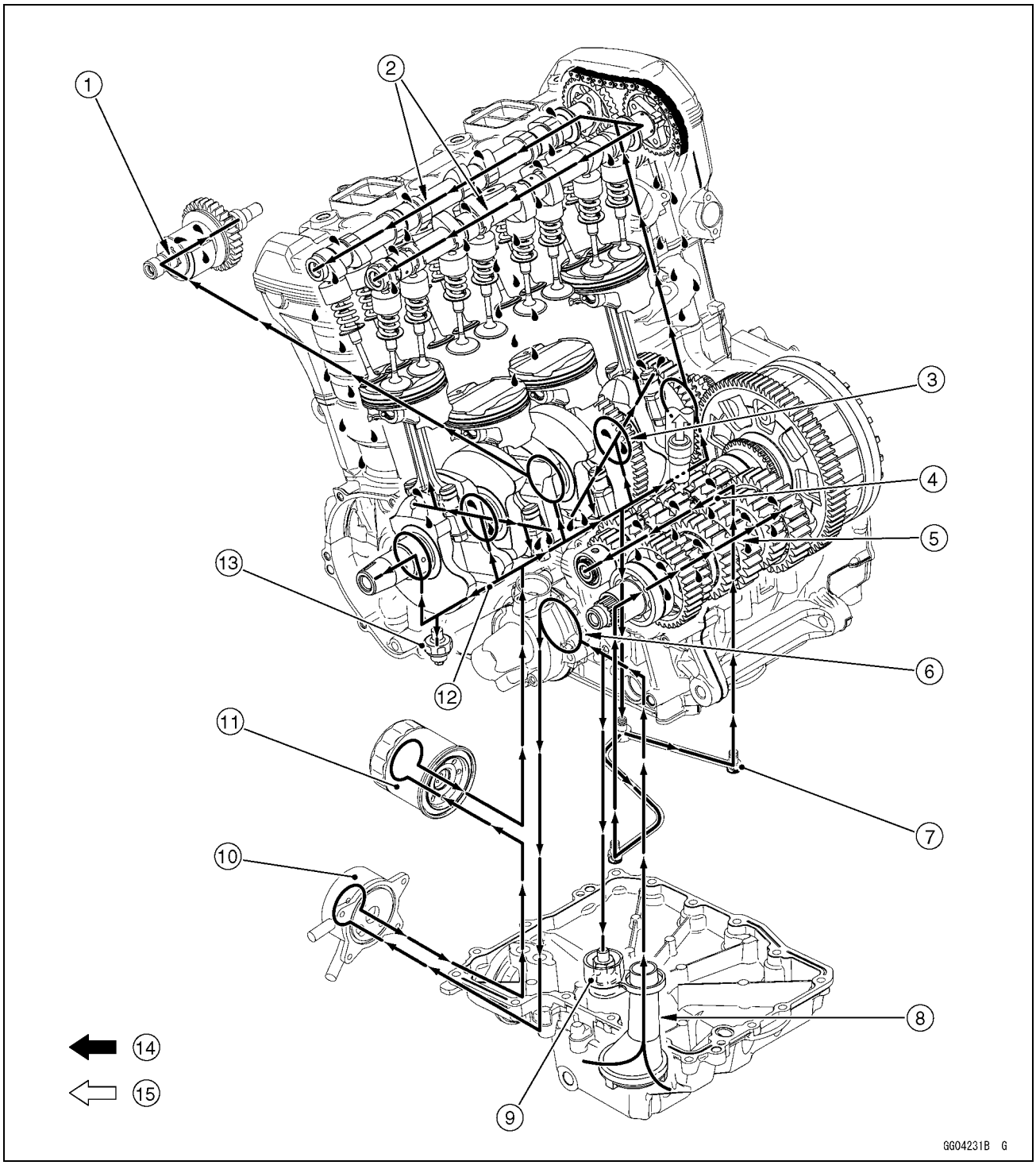
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Filler Plug	–	–	–	Hand-tighten
2	Oil Cooler Bolts	12	1.2	106 in·lb	
3	Oil Passage Plugs	20	2.0	15	L
4	Radiator (Water) Hose Clamp Screws	3.0	0.31	27 in·lb	
5	Oil Pressure Switch	15	1.5	11	SS
6	Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·lb	
7	Oil Pressure Relief Valve	15	1.5	11	L
8	Oil Filter	17	1.7	13	G, R
9	Oil Filter Pipe	25	2.5	18	L
10	Oil Pan Bolts	12	1.2	106 in·lb	S
11	Engine Oil Drain Bolt	29	3.0	21	
12	Lower Fairing Bracket Bolts	12	1.2	106 in·lb	

13. Apply molybdenum disulfide oil solution to the hole of the oil pump drive gear shaft.
14. See the text

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
S: Follow the specified tightening sequence.
SS: Apply silicone sealant.

Engine Oil Flow Chart



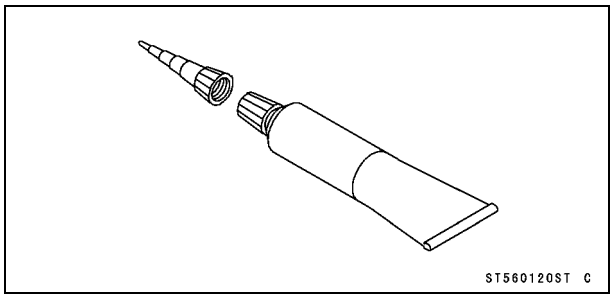
1. Balancer Oil Passage
2. Camshaft Oil Passage
3. Crankshaft Oil Passage
4. Drive Shaft Oil Passage
5. Output Shaft Oil Passage
6. Oil Pump
7. Oil Pipe
8. Oil Screen
9. Oil Pressure Relief Valve
10. Oil Cooler
11. Oil Filter
12. Main Oil Passage
13. Oil Pressure Switch
14. Oil
15. Blowby Gas

Specifications

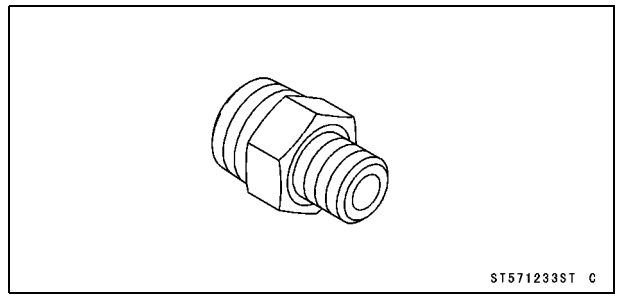
Item	Standard
Engine Oil	
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2
Viscosity	SAE 10W-40
Capacity:	3.2 L (3.4 US gt) (when filter is not removed)
	3.8 L (4.0 US gt) (when filter is removed)
	4.0 L (4.2 US gt) (when engine is completely dry)
Level	Between upper and lower level lines (Wait several minutes after idling or running)
Oil Pressure Measurement	
Oil Pressure	255 ~ 304 kPa (2.6 ~ 3.1 kgf/cm², 37 ~ 44 psi) at 4 000 r/min (rpm), Oil Temperature 50°C (122°F)

Special Tools and Sealants

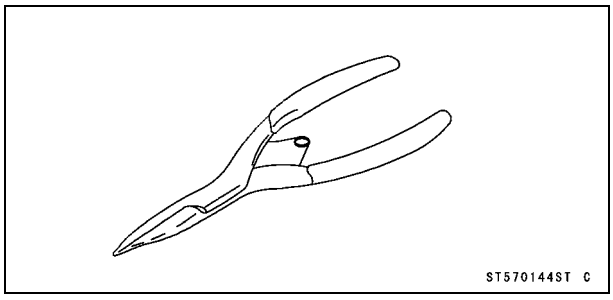
Liquid Gasket, TB1211:
56019-120



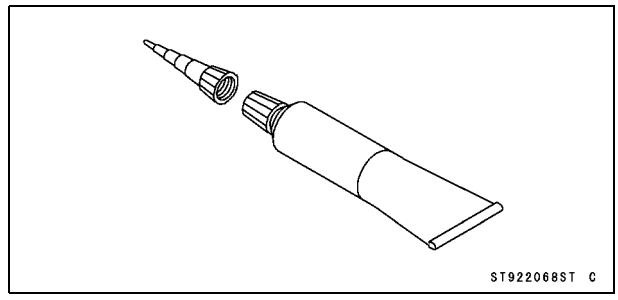
Oil Pressure Gauge Adapter, PT3/8:
57001-1233



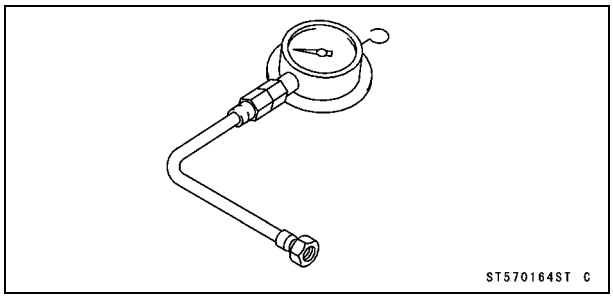
Outside Circlip Pliers:
57001-144



Liquid Gasket, TB1207B:
92104-2068



Oil Pressure Gauge, 10 kgf/cm²:
57001-164



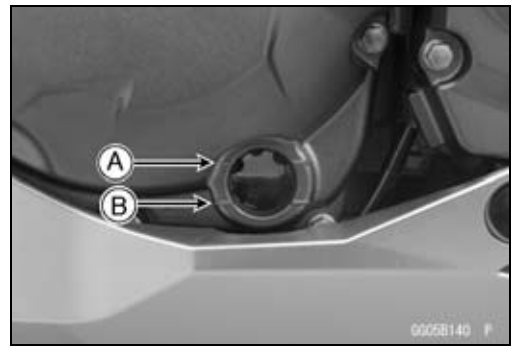
Engine Oil and Oil Filter

⚠ WARNING

Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine seizure, accident, and injury. Check the oil level before each use and change the oil and filter according to the periodic maintenance chart.

Oil Level Inspection

- Check that the engine oil level is between the upper [A] and lower [B] levels in the oil level inspection window.



NOTE

- ○*Situate the motorcycle so that it is perpendicular to the ground.*
- ○*If the motorcycle has just been used, wait several minutes for all the oil to drain down.*
- ○*If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.*

NOTICE

Racing the engine before the oil reaches every part can cause engine seizure.
If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the warning indicator light (LED) and oil pressure warning symbol will blink. If this blink stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

★If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.

★If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.

NOTE

- ○*If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.*

Engine Oil Change

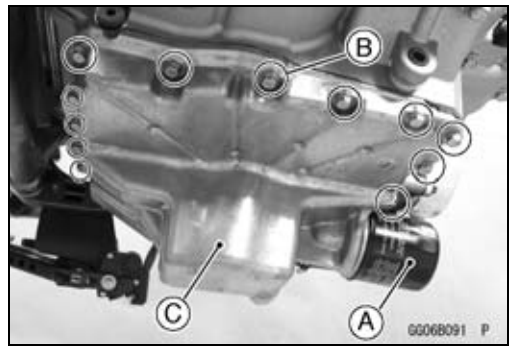
- Refer to the Engine Oil Change in the Periodic Maintenance chapter.

Oil Filter Replacement

- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

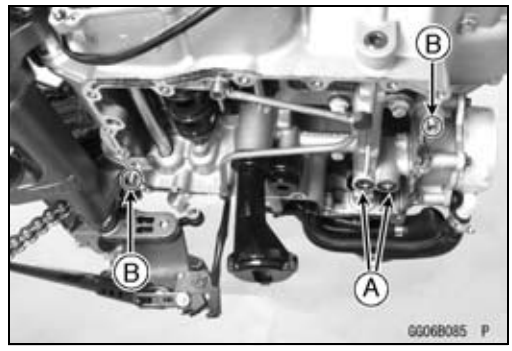
Oil Pan

Oil Pan Removal



- Remove:
  Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  Oil Filter [A] (see Oil Filter Replacement in the Periodic Maintenance chapter)
  Oil Pan Bolts [B]
  Oil Pan [C]
- Remove the following parts if necessary.
  Oil Screen (see Oil Screen Removal)
  Oil Pipe (see Oil Pipe Removal)
  Oil Pressure Relief Valve (see Oil Pressure Relief Valve Removal)

Oil Pan Installation



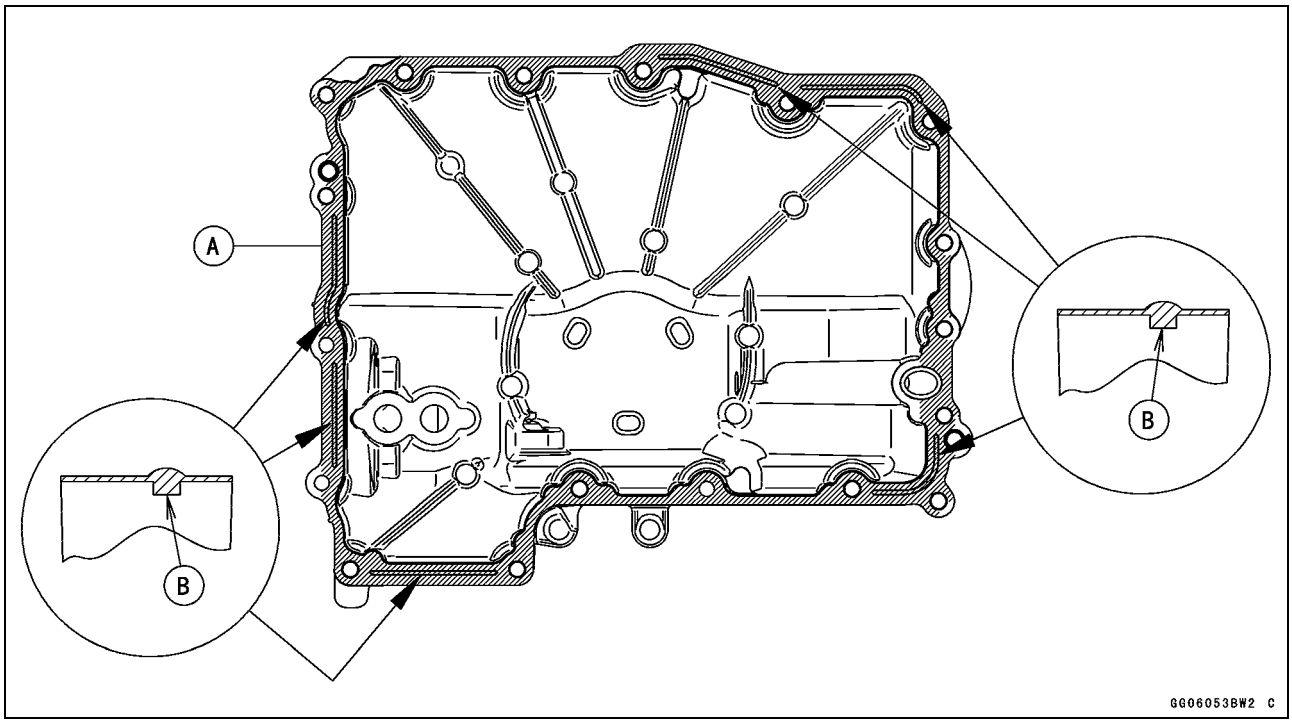
- Install the following parts if removed.
  Oil Pressure Relief Valve (see Oil Pressure Relief Valve Installation)
  Oil Pipe (see Oil Pipe Installation)
  Oil Screen (see Oil Screen Installation)
- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings, and install them.
- Install the dowel pins [B].

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the mating surface of the oil pan.

Sealant - Liquid Gasket, TB1207B: 92104-2068

NOTE

○*Especially, apply liquid gasket so that it shall be filled up on the grooves [B].*



Oil Pan

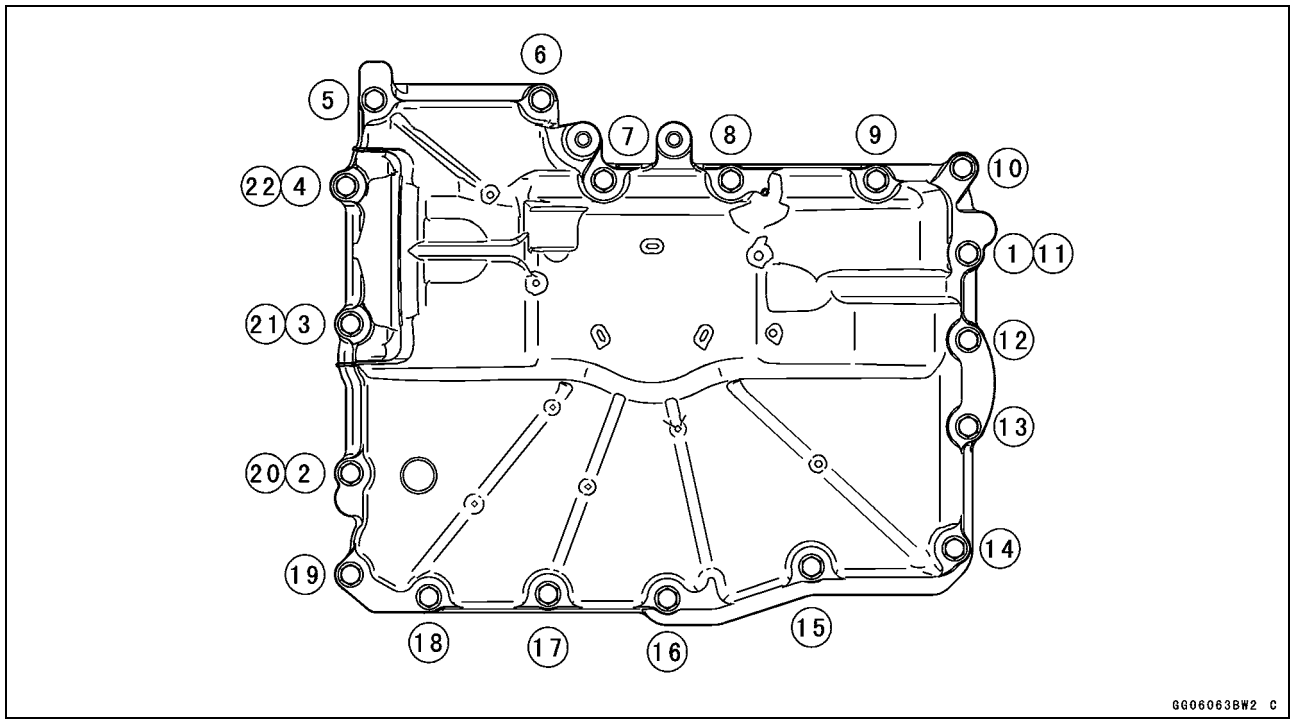
NOTE

○*Make the application finish within 7 minutes when the liquid gasket to the mating surface of the oil pan is applied.*

○*Moreover fit the oil pan and tighten the bolts just after application of the liquid gasket.*

● Tighten the oil pan bolts following sequence [1 ~ 20].

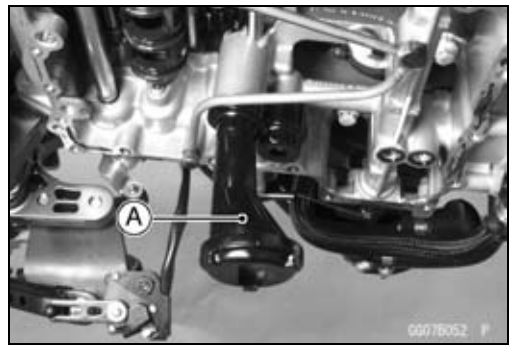
Torque - Oil Pan Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)



● Install the removed parts (see appropriate chapters).

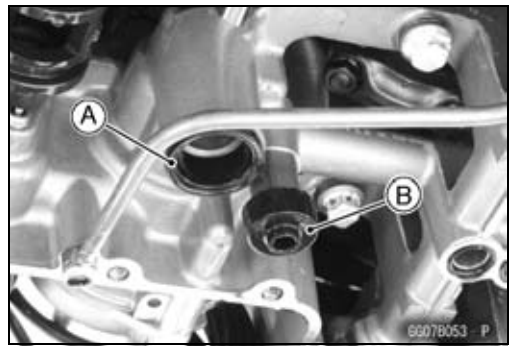
Oil Screen

Oil Screen Removal



- Remove:
  Oil Pan (see Oil Pan Removal)
  Oil Screen [A]

Oil Screen Installation



- Clean the oil screen (see Oil Screen Cleaning).
- Replace the O-ring [A] with a new one, and install it.
- Apply grease to the O-ring.
- Install the rubber damper [B] to the oil pressure relief valve.
- Install the oil screen.

Oil Screen Cleaning

- Remove the oil screen (see Oil Screen Removal).
- Clean the oil screen with a high flash-point solvent and remove the particles stuck.
- Blow away the particles by applying compressed air [A] from the inside to the outside (from the clean side to the dirty side).

⚠ WARNING

Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the screen in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash point solvent to clean the screen.

NOTE

○*While cleaning the screen, check for any metal particles that might indicate internal engine damage.*

- Check the screens carefully for any damage.

★If the screen is damaged, replace the oil screen.

Oil Pressure Relief Valve

Oil Pressure Relief Valve Removal

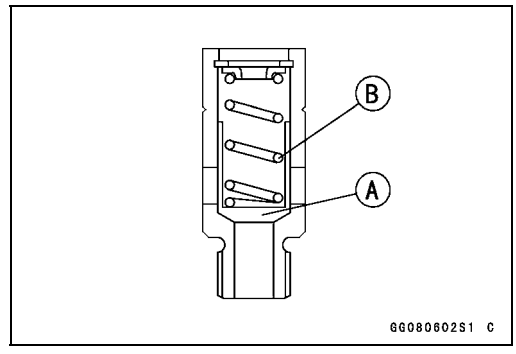
- Remove:
  Oil Screen (see Oil Screen Removal)
  Oil Pressure Relief Valve [A]

Oil Pressure Relief Valve Installation

- Apply a non-parmanent locking agent to the threads of the oil pressure relief valve, and tighten it.

Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)

Oil Pressure Relief Valve Inspection



- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

NOTE

○*Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

★If any rough spots are found during above inspection, wash the valve clean with a high flash-point solvent and blow out any foreign particles that may be in the valve with compressed air.

⚠ WARNING

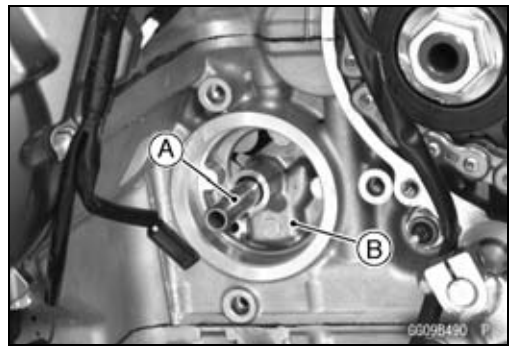
Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the oil pressure relief valve in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash point solvent to clean the oil pressure relief valve.

★If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

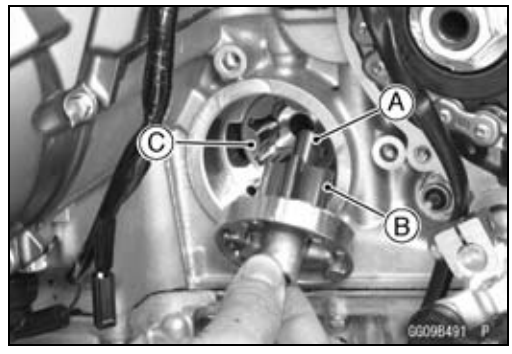
Oil Pump

Oil Pump Removal

- Remove:
  Water Pump (see Water Pump Removal in the Cooling System chapter)
- Pull the water pump shaft [A] to remove the oil pump cover [B].

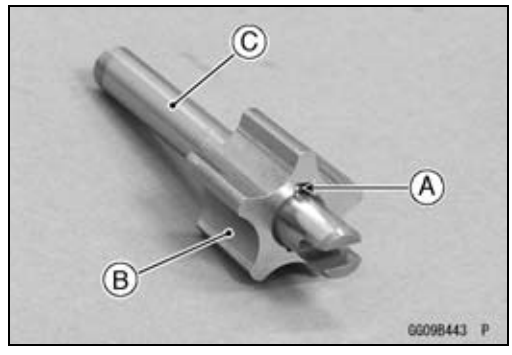


- Remove:
  Oil (Water) Pump Shaft [A] with Inner Rotor [B]
  Outer Rotor [C]

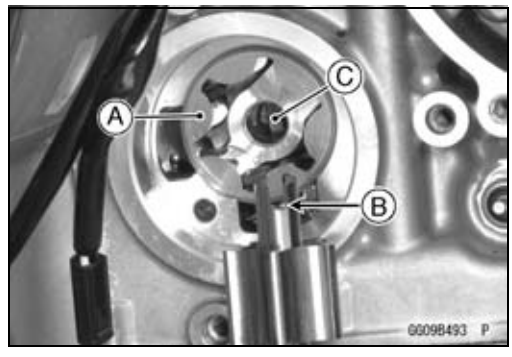


Oil Pump Installation

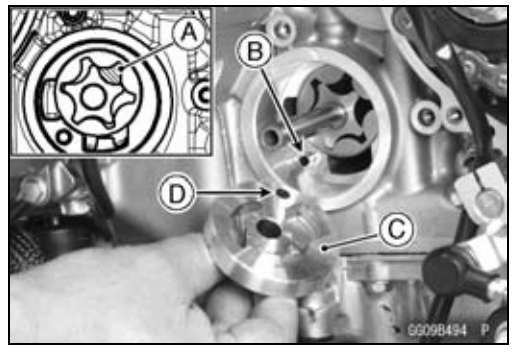
- Assemble the pin [A], inner rotor [B] and oil (water) pump shaft [C].
- Apply engine oil to the sliding surfaces of the inner rotor and shaft.



- Apply engine oil to the sliding surfaces of the outer rotor [A] and install it into the crankcase.
- Turn the pump shaft so that the slot [B] in its shaft fits onto the projection [C] of the pump drive gear shaft.



- Pack grease into the cavity [A] between the inner rotor and outer rotor for improve the oil pump initial priming.
- Install the dowel pin [B].
- Install the oil pump cover [C] so that the dowel pin fits into the hole [D] of the oil pump cover.
- Install the water pump (see Water Pump Installation in the Cooling System chapter).

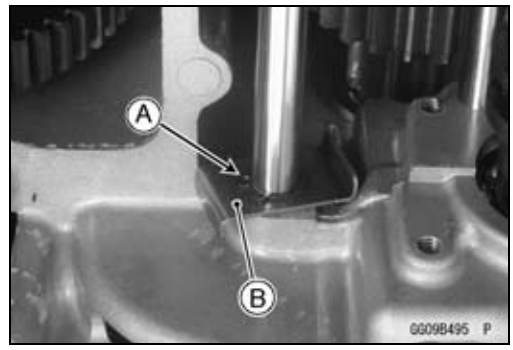


Oil Pump

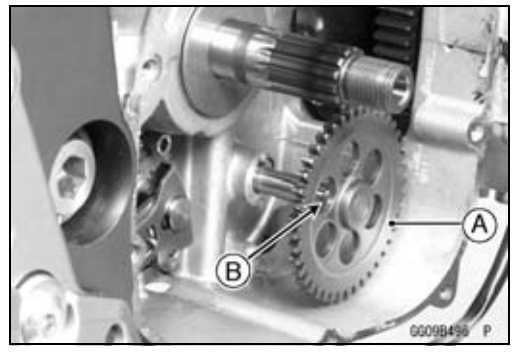
Oil Pump Drive Gear Removal

- Remove:
  Clutch (see Clutch Removal in the Clutch chapter)
  Oil Pan (see Oil Pan Removal)
  Circlip [A] and Washer [B]

Special Tool - Outside Circlip Pliers: 57001-144

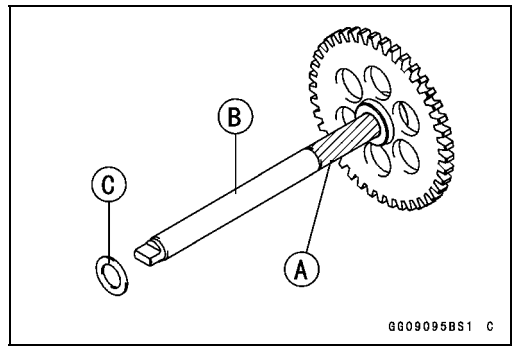


- Remove:
  Oil Pump Drive Gear [A]
  Washer [B]



Oil Pump Drive Gear Installation

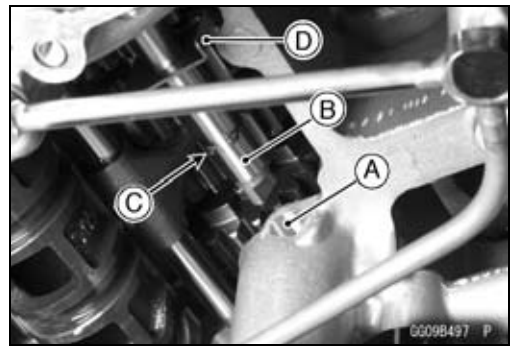
- Apply molybdenum grease to the journal portion [A] on the oil pump drive gear shaft [B].
- Install the washer [C] to the shaft.



- Apply molybdenum disulfide oil solution to the hole [A] of the oil pump drive gear shaft in the crankcase.
- Insert the oil pump drive gear shaft [B] to the lower crankcase.
- Replace the circlip [C] with a new one.
- Install the washer [D] and circlip.

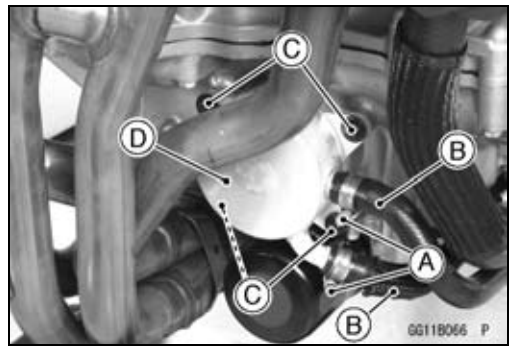
Special Tool - Outside Circlip Pliers: 57001-144

- Align the projection on the shaft with the oil (water) pump shaft slot by turning the oil pump drive gear.
- Set the circlip original position.



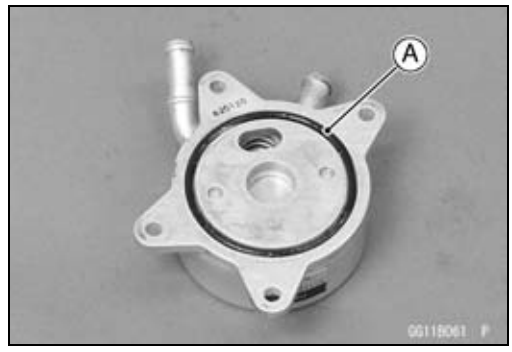
Oil Cooler

Oil Cooler Removal



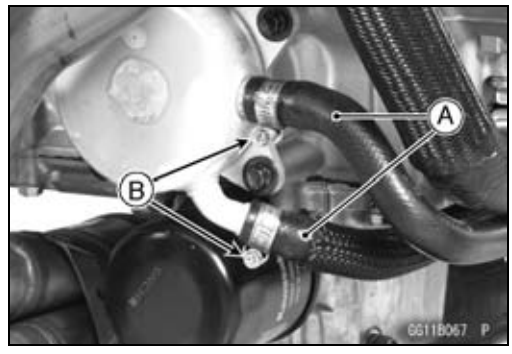
- Remove:
  Left Lower Fairing Assembly (see Lower Fairing Assembly Removal in the Frame chapter)
  Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  Water Hose Clamp Screws (Loosen) [A]
  Water Hoses [B]
  Oil Cooler Bolts [C]
  Oil Cooler [D]

Oil Cooler Installation



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring and install it.
- Install the oil cooler.
- Tighten:

Torque - Oil Cooler Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)



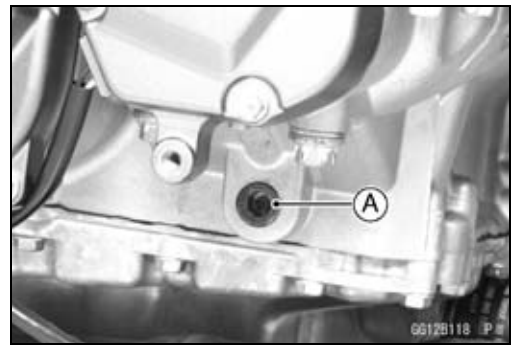
- Install the water hoses [A] and clamps as shown in the figure.
- Tighten:

Torque - Radiator (Water) Hose Clamp Screws [B]: 3.0 N·m (0.31 kgf·m, 27 in·lb)

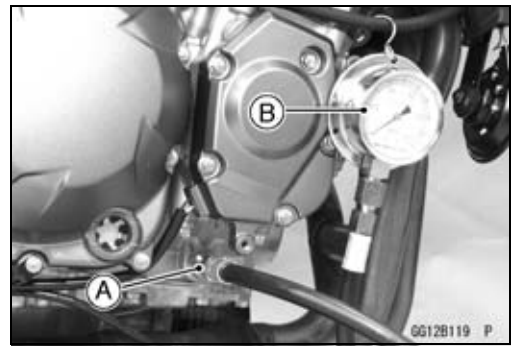
- Install the removed parts (see appropriate chapters).

Oil Pressure Measurement

Oil Pressure Measurement



- Remove the right lower fairing (see Lower Fairing Removal in the Frame chapter).
- Remove the oil passage plug [A].



- Attach the adapter [A] and gauge [B] to the plug hole.

Special Tools - Oil Pressure Gauge, 10 kgf/cm²: 57001-164
Oil Pressure Gauge Adapter, PT3/8: 57001 -1233

- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

★If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert wear immediately.

★If the reading is much higher than the standard, check the oil passages for clogging.

Oil Pressure
Standard: 255 ~ 304 kPa (2.6 ~ 3.1 kgf/cm², 37 ~ 44 psi) at 4 000 r/min (rpm), oil temperature 50°C (122°F)

- Stop the engine.
- Remove the oil pressure gauge and adapter.

⚠ WARNING

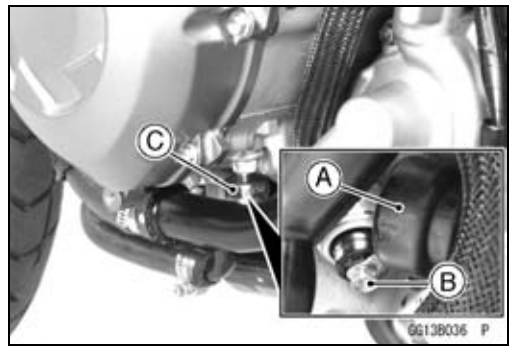
Take care against burns form hot engine oil that will drain through the oil passage when the gauge adapter is removed.

- Apply a non-permanent locking agent to the oil passage plug, and tighten it.

Torque - Oil Passage Plug: 20 N·m (2.0 kgf·m, 15 ft·lb)

Oil Pressure Switch

Oil Pressure Switch Removal



- Remove:
  Left Lower Fairing Assembly (see Lower Fairing Assembly Removal in the Frame chapter)
  Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  Switch Cover [A]
  Switch Terminal Bolt [B]
  Oil Pressure Switch [C]

Oil Pressure Switch Installation

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply silicone sealant to the threads of the oil pressure switch and tighten it.

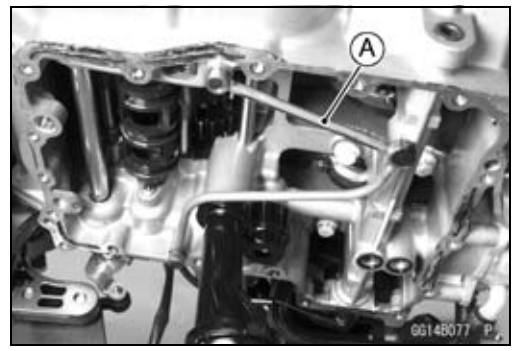
  Sealant - Liquid Gasket, TB1211: 56019-120

  Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)
- Install the switch lead.
- Tighten:

  Torque - Oil Pressure Switch Terminal Bolt: 2.0 N·m (0.20 kgf·m, 18 in·lb)
- Apply grease to the terminal.

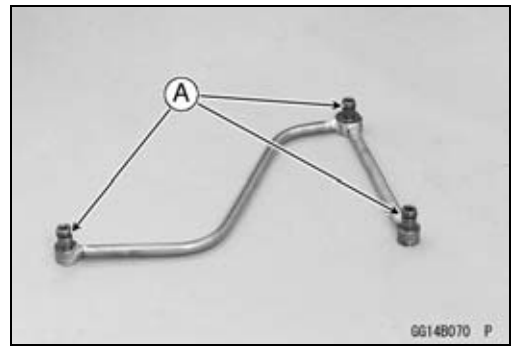
Oil Pipe

Oil Pipe Removal



- Remove:
  Oil Pan (see Oil Pan Removal)
  Oil Pipe [A]

Oil Pipe Installation



- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings, and install them.

Engine Removal/Installation

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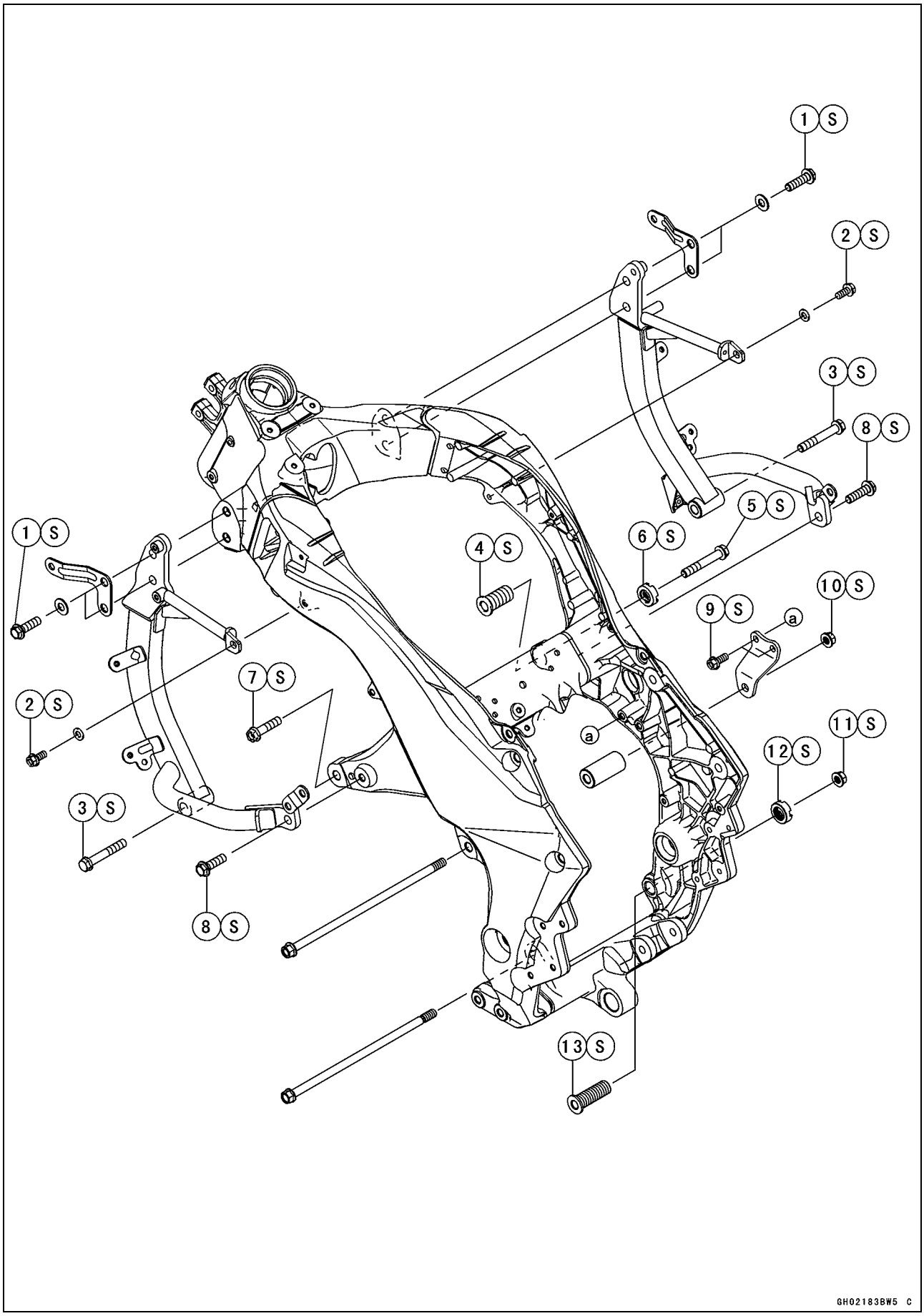
Exploded View



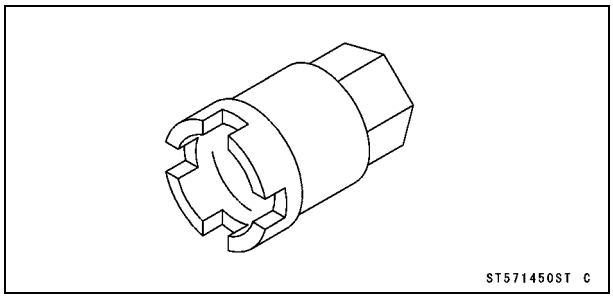
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Upper Engine Bracket Bolts (M10)	59	6.0	44	S
2	Upper Engine Bracket Bolt (M8)	27	2.8	20	S
3	Lower Engine Bracket Bolts	59	6.0	44	S
4	Upper Adjusting Collar	9.8	1.0	87 in·lb	S
5	Upper Engine Mounting Bolt (L = 65)	44	4.5	32	S
6	Upper Adjusting Collar Locknut	49	5.0	36	S
7	Upper Engine Mounting Bolt (L = 54)	44	4.5	32	S
8	Rear Engine Bracket Bolts	59	6.0	44	S
9	Middle Engine Bracket Bolts	25	2.5	18	L, S
10	Middle Engine Mounting Nut	44	4.5	32	S
11	Lower Engine Mounting Nut	44	4.5	32	S
12	Lower Adjusting Collar Locknut	49	5.0	36	S
13	Lower Adjusting Collar	9.8	1.0	87 in·lb	S

L: Apply a non-permanent locking agent.
S: Follow the specified tightening sequence.

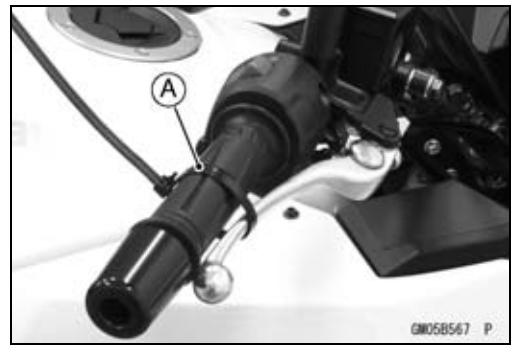
Special Tool

Engine Mount Nut Wrench:
57001-1450



Engine Removal/Installation

Engine Removal



- Support the rear part of the swingarm with a stand.
- Squeeze the brake lever slowly and hold it with a band [A].

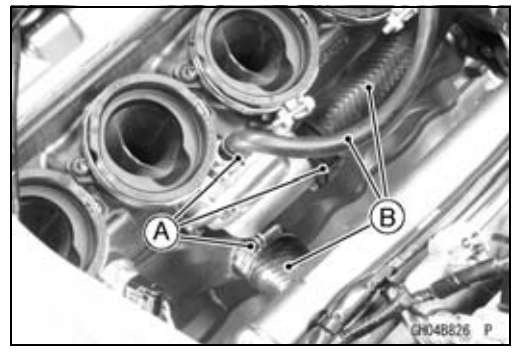
⚠ WARNING

Motorcycle may fall over unexpectedly resulting in an accident or injury. Be sure to hold the front brake when removing the engine.

NOTICE

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.

- Remove:
  Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  Air Switching Valve (see Air Switching Valve Removal in the Engine Top End chapter)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Shift Lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter)

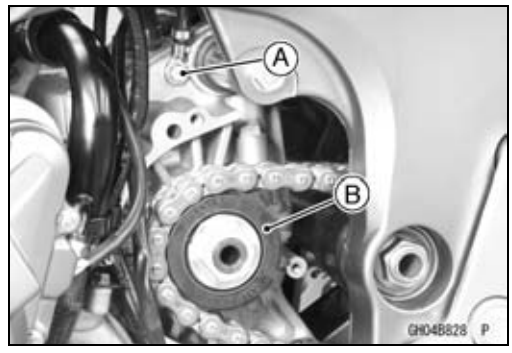


- Remove:
  Clamps [A]
  Water Hoses [B]

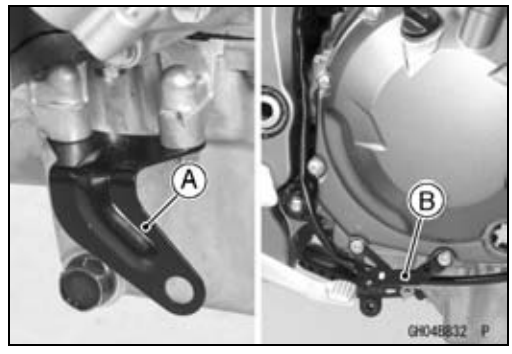
- Remove the connector [A] from the bracket on the air suction valve cover and disconnect the connector.
- Disconnect:
  Starter Motor Cable (see Starter Motor Removal in the Electrical System chapter)
  Alternator Lead Connector (see Alternator Cover Removal in the Electrical System chapter)
  Crankshaft Sensor Lead Connector (see Crankshaft Sensor Removal in the Electrical System chapter)

Engine Removal/Installation

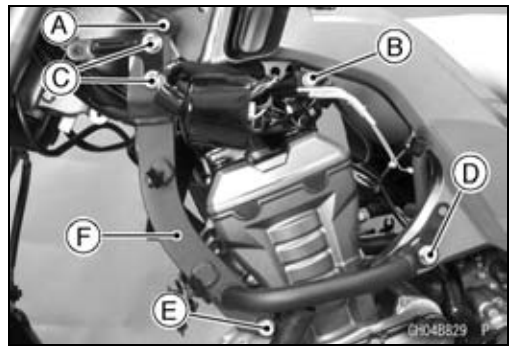
● Remove:
Engine Ground Cable Terminal Bolt [A]
Engine Sprocket [B] (see Engine Sprocket Removal in the Final Drive chapter)
● Remove the drive chain from the output shaft.



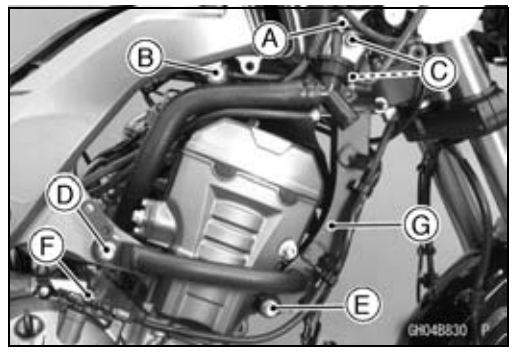
● Remove
Left Lower Fairing Stay [A]
Right Lower Fairing Stay [B]



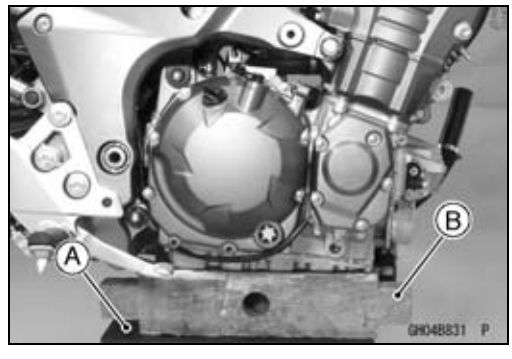
● Remove: (Left Side)
Stay Mount Bolt [A]
Upper Engine Bracket Bolts (M8) [B] and Washer
Upper Engine Bracket Bolts (M10) [C] and Washer
Rear Engine Bracket Bolt [D]
Lower Engine Bracket Bolt [E]
Left Engine Bracket [F]



● Remove: (Right Side)
Stay Mount Bolt [A]
Upper Engine Bracket Bolts (M8) [B] and Washer
Upper Engine Bracket Bolts (M10) [C] and Washer
Rear Engine Bracket Bolt [D]
Lower Engine Bracket Bolt [E]
● Disconnect the clutch cable lower end [F] (see Clutch Cable Removal in the Clutch chapter).
● Free the clutch cable and horn lead from the clamps on the right engine bracket [G].
● Remove the right engine bracket.

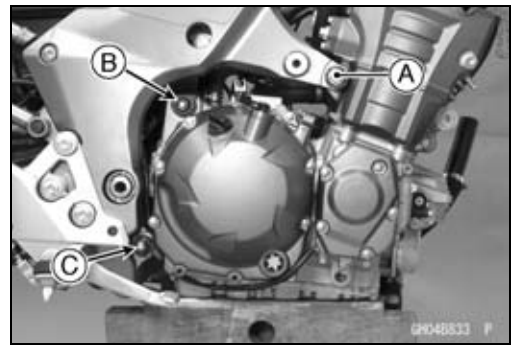


● Support the engine with a suitable stand [A].
○Put a plank [B] onto the suitable stand for engine balance.



Engine Removal/Installation

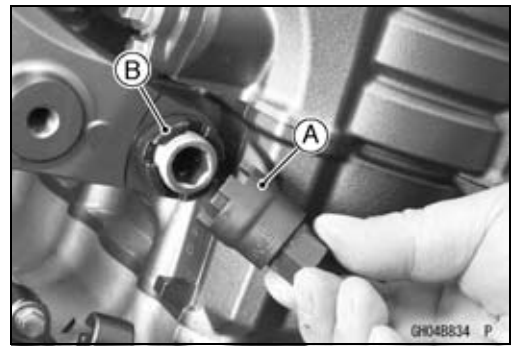
- Remove:
  Upper Engine Mounting Bolt [A] (Both Sides)
  Middle Engine Mounting Nut [B], Bolt and Collar
  Lower Engine Mounting Nut [C]



- Using the nut wrench [A], loosen the upper adjusting collar locknut [B].

  Special Tool - Engine Mount Nut Wrench: 57001-1450

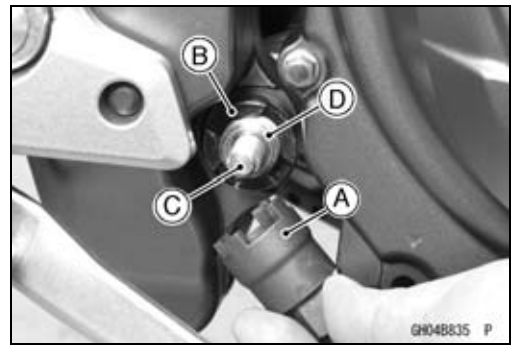
- Using the Hexagon Wrench, turn the adjusting collar [C] counterclockwise to make the gap between the engine and adjusting collar.



- Using the nut wrench [A], loosen the lower adjusting collar locknut [B].

  Special Tool - Engine Mount Nut Wrench: 57001-1450

- Remove the lower engine mounting bolt [C].
- Using the Hexagon Wrench, turn the adjusting collar [D] counterclockwise to make the gap between the engine and adjusting collar.
- Using the stand, take out the engine.



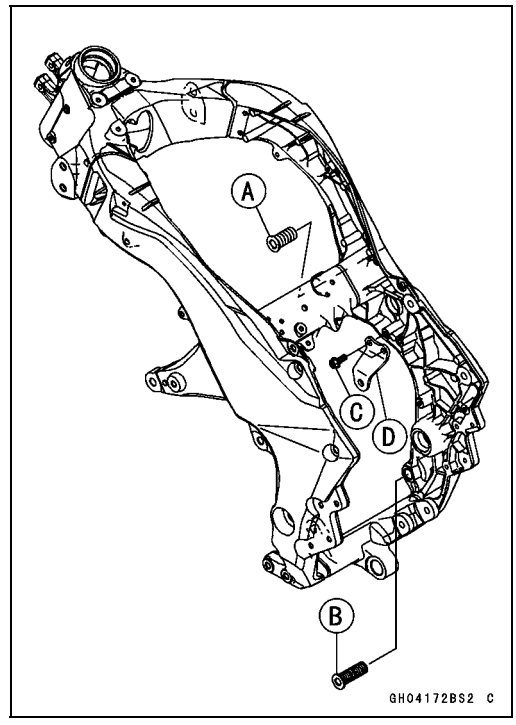
Engine Installation

- Support the engine with a suitable stand.

○Put a plank onto the suitable stand for engine balance.

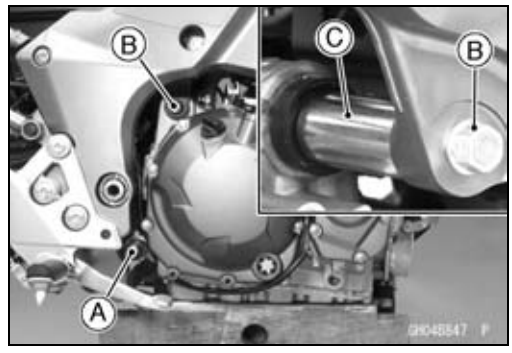
- Screw the upper adjusting collar [A] and lower adjusting collar [B] into the frame all the way.
- Apply a non-parmanent locking agent to the threads of the middle engine bracket bolts [C].
- Install the middle engine bracket [D] and tighten the bolts.

  Torque - Middle Engine Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



Engine Removal/Installation

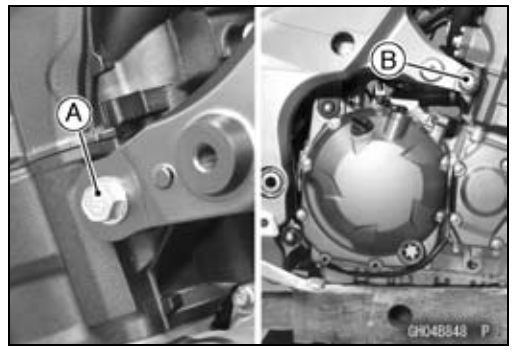
- Insert the lower engine mounting bolt [A] from the left.
- Insert the middle engine mounting bolt [B] from the left, placing the collar [C] between the engine and frame.



- Install and tighten the left upper engine mounting bolts (L = 54) [A].

  Torque - Upper Engine Mounting Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Temporarily install the right upper engine mounting bolt (L = 65) [B].



- Tighten the lower adjusting collar [A].

  Torque - Lower Adjusting Collar: 9.8 N·m (1.0 kgf·m, 87 ft·lb)

○Be careful not to overtighten the adjusting collar.

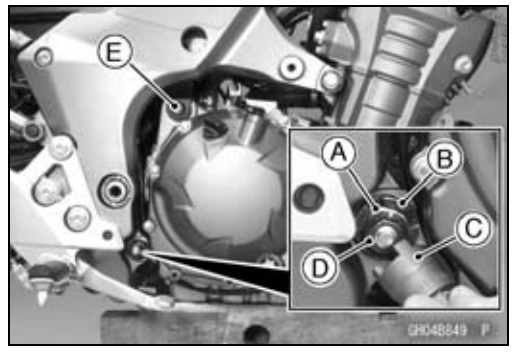
- Tighten the lower adjusting collar locknut [B].

  Torque - Lower Adjusting Collar Locknut: 49 N·m (5.0 kgf·m, 36 ft·lb)

  Special Tool - Engine Mount Nut Wrench [C]: 57001-1450

- Tighten the lower engine mounting nut [D] and middle engine mounting nut [E].

  Torque - Lower Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)
  Middle Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)



- Remove the right upper engine mounting bolt (L = 65) [A].
- Tighten the upper adjusting collar [B].

  Torque - Upper Adjusting Collar: 9.8 N·m (1.0 kgf·m, 87 ft·lb)

○Be careful not to overtighten the adjusting collar.

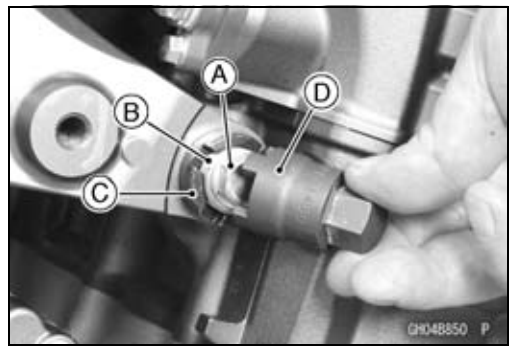
- Tighten the upper adjusting collar locknut [C].

  Torque - Upper Adjusting Collar Locknut: 49 N·m (5.0 kgf·m, 36 ft·lb)

  Special Tool - Engine Mount Nut Wrench [D]: 57001-1450

- Tighten the right upper engine mounting bolt (L = 65).

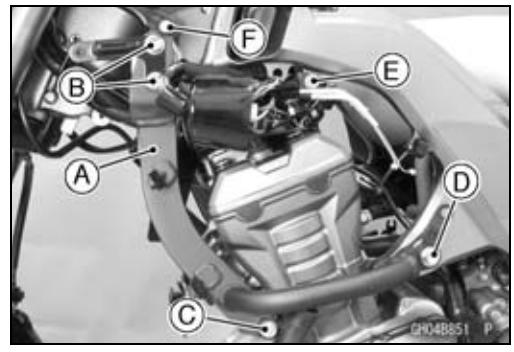
  Torque - Right Upper Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)



Engine Removal/Installation

- Install the left engine bracket [A] and tighten the mounting bolts evenly.

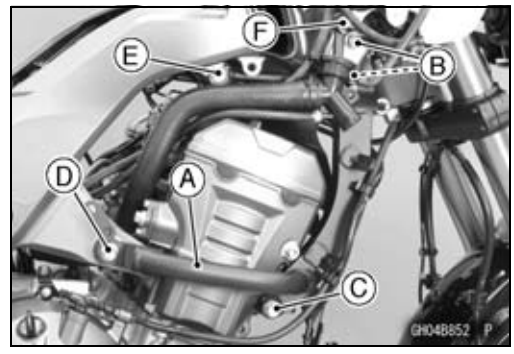
Torque - Upper Engine Bracket Bolts (10 mm) [B]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Lower Engine Bracket Bolts [C]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Rear Engine Bracket Bolts [D]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Upper Engine Bracket Bolts (8 mm) [E]: 27 N·m (2.8 kgf·m, 20 ft·lb)



- Tighten the stay mount bolt [F].

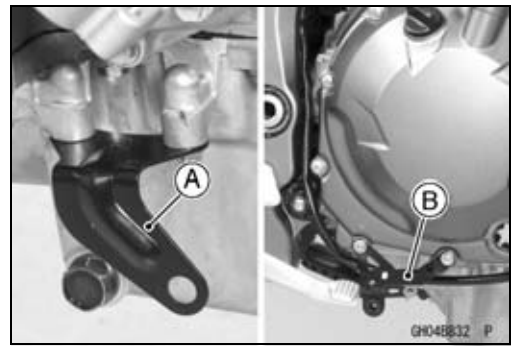
- Install the right engine bracket [A] and tighten the mounting bolts evenly.

Torque - Upper Engine Bracket Bolts (10 mm) [B]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Lower Engine Bracket Bolts [C]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Rear Engine Bracket Bolts [D]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Upper Engine Bracket Bolts (8 mm) [E]: 27 N·m (2.8 kgf·m, 20 ft·lb)



- Tighten the stay mount bolt [F].

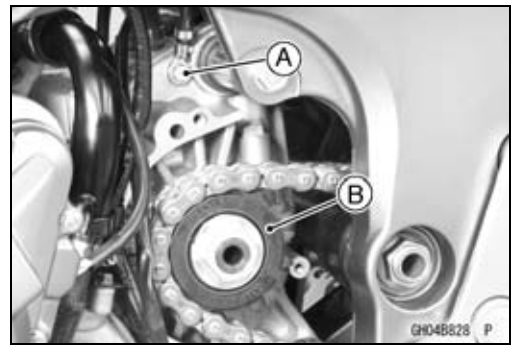
- Install
  Left Lower Fairing Stay [A]
  Right Lower Fairing Stay [B]



- Install the engine ground cable terminal vertically and tighten the bolt [A].

Torque - Engine Ground Cable Terminal Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the engine sprocket [B] (see Engine Sprocket Installation in the Final Drive chapter).



- Run the leads, cables and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).
- Adjust:
  Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)
  Drive Chain (see Drive Chain Slack Inspection in the Periodic Maintenance chapter)

Engine Removal/Installation

- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Fill the engine with coolant (see Coolant Change in the Periodic Maintenance chapter).

Crankshaft/Transmission

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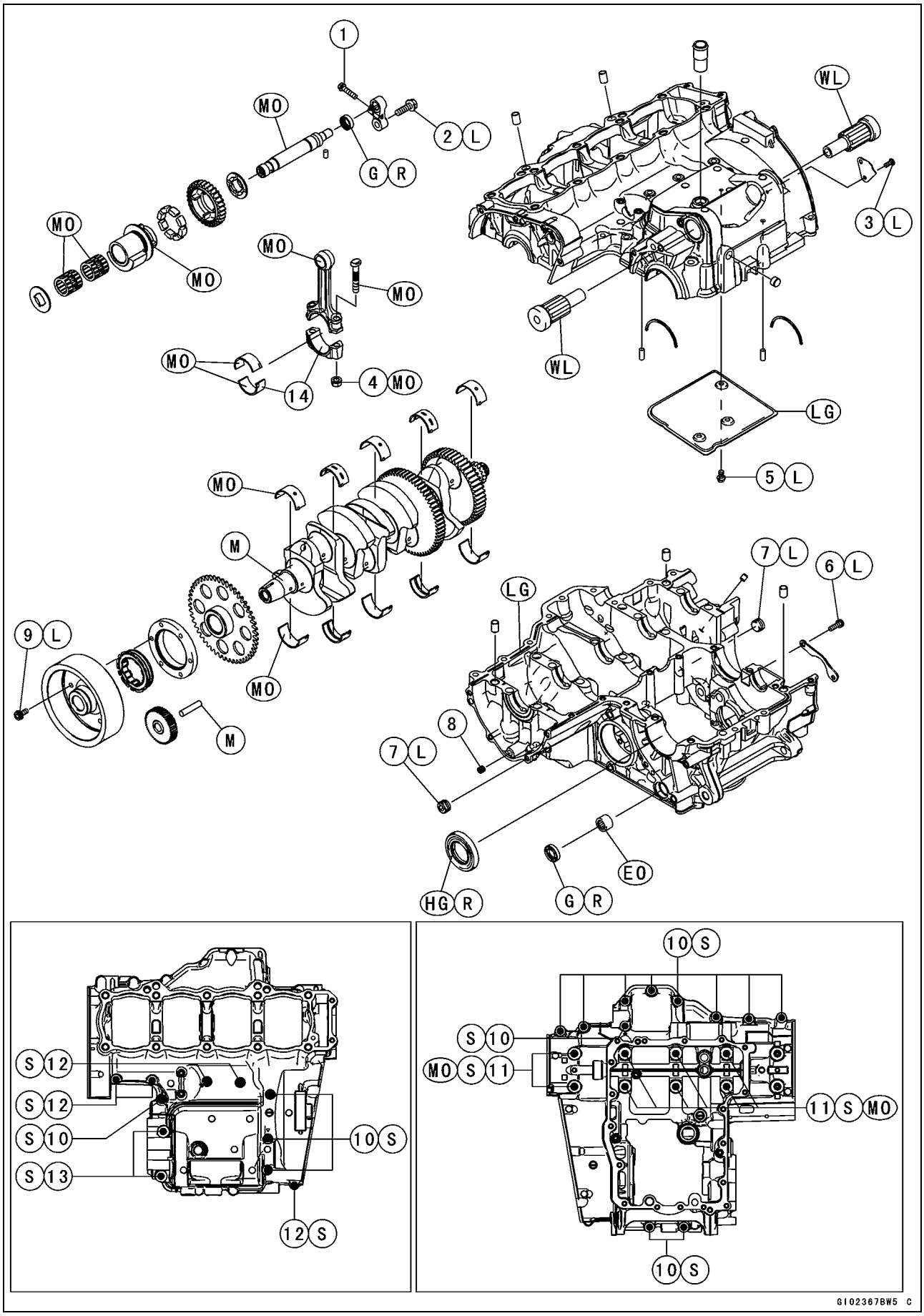
Exploded View

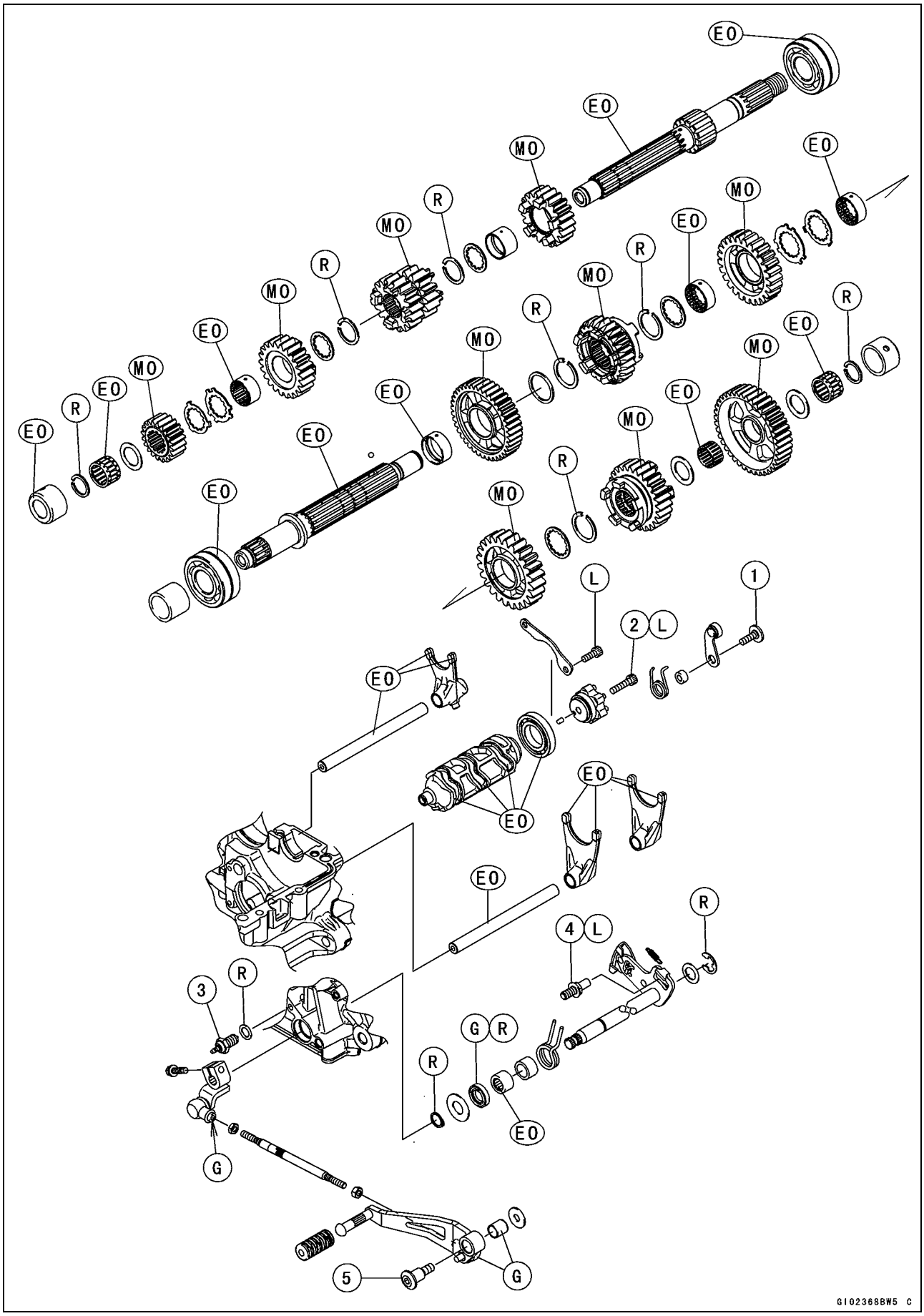


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Balancer Shaft Clamp Bolt	9.8	1.0	87 in·lb	
2	Balancer Shaft Lever Bolt	25	2.5	18	L
3	Breather Side Plate Bolt	5.9	0.60	52 in·lb	L
4	Connecting Rod Big End Nuts	see the text	←	←	MO
5	Breather Plate Bolts	9.8	1.0	87 in·lb	L
6	Shift Drum Bearing Holder Bolts	12	1.2	106 in·lb	L
7	Oil Passage Plugs	20	2.0	15	L
8	Oil Passage Plug	9.8	1.0	87 in·lb	
9	Starter Motor Clutch Bolts	12	1.2	106 in·lb	L
10	Crankcase Bolts (M7)	20	2.0	15	S
11	Crankcase Bolts (M9)	42	4.3	31	S, MO
12	Crankcase Bolts (M6)	12	1.2	106 in·lb	S
13	Crankcase Bolts (M8)	27	2.8	20	S

14. Do not apply any grease or oil.
EO: Apply engine oil.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)
R: Replacement Parts
S: Follow the specified tightening sequence.
WL: Apply soap and water solution or rubber lubricant.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Gear Positioning Lever Bolt	12	1.2	106 in·lb	
2	Shift Drum Cam Bolt	12	1.2	106 in·lb	L
3	Neutral Switch	15	1.5	11	
4	Shift Shaft Return Spring Pin	39	4.0	29	L
5	Shift Pedal Mounting Bolt	25	2.5	18	

EO: Apply engine oil.
G: Apply grease.
MO: Apply molybdenum disulfide oil.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)
L: Apply a non-permanent locking agent.
R: Replacement Parts

Specifications

Item	Standard	Service Limit
Crankcase, Crankshaft, Connecting Rods		
Connecting Rod Bend	– – –	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Twist	– – –	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Big End Side Clearance	0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)	0.58 mm (0.023 in.)
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.030 ~ 0.060 mm (0.0012 ~ 0.0024 in.)	0.10 mm (0.0039 in.)
Crankpin Diameter:	34.484 ~ 34.500 mm (1.3576 ~ 1.3583 in.)	34.47 mm (1.357 in.)
Marking:		
None	34.484 ~ 34.492 mm (1.3576 ~ 1.3579 in.)	– – –
○	34.493 ~ 34.500 mm (1.3580 ~ 1.3583 in.)	– – –
Connecting Rod Big End Inside Diameter:	37.500 ~ 37.516 mm (1.4764 ~ 1.4770 in.)	– – –
Marking:		
None	37.500 ~ 37.508 mm (1.4764 ~ 1.4766 in.)	– – –
○	37.509 ~ 37.516 mm (1.4767 ~ 1.4770 in.)	– – –
Connecting Rod Big End Bearing Insert Thickness:		
Brown	1.478 ~ 1.483 mm (0.05819 ~ 0.05839 in.)	– – –
Black	1.483 ~ 1.488 mm (0.05839 ~ 0.05858 in.)	– – –
Blue	1.488 ~ 1.493 mm (0.05858 ~ 0.05878 in.)	– – –
Connecting Rod Bolt Stretch	(Usable Range)	
	0.20 ~ 0.32 mm (0.0079 ~ 0.0126 in.)	– – –
Crankshaft Side Clearance	0.09 ~ 0.19 mm (0.0035 ~ 0.0075 in.)	0.39 mm (0.0153 in.)
Crankshaft #3 Main Journal Width	23.49 ~ 23.54 mm (0.9248 ~ 0.9267 in.)	– – –
Crankshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.0020 in.)
Crankshaft Main Bearing Insert/Journal Clearance	0.010 ~ 0.034 mm (0.0004 ~ 0.0013 in.)	0.06 mm (0.0024 in.)
Crankshaft Main Journal Diameter:	34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.)	34.96 mm (1.3764 in.)
Marking:		
None	34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.)	– – –
1	34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.)	– – –
Crankcase Main Bearing Inside Diameter:	38.000 ~ 38.016 mm (1.4961 ~ 1.4967 in.)	– – –
Marking		
None	38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.)	– – –
○	38.000 ~ 38.008 mm (1.4961 ~ 1.4963 in.)	– – –

Specifications

Item	Standard	Service Limit
Crankshaft Main Bearing Insert Thickness:		
Brown	1.491 ~ 1.495 mm (0.0587 ~ 0.0589 in.)	– – –
Black	1.495 ~ 1.499 mm (0.0589 ~ 0.0590 in.)	– – –
Blue	1.499 ~ 1.503 mm (0.0590 ~ 0.0592 in.)	– – –
Transmission		
Shift Fork Ear Thickness	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Gear Groove Width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.25 mm (0.246 in.)
Shift Fork Guide Pin Diameter	6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)	6.8 mm (0.268 in.)
Shift Drum Groove Width	7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)	7.3 mm (0.287 in.)

Connecting Rod Big End Bearing Insert Selection

Con-rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-0124
None	None	Black	92139-0123
○	○		
○	None	Blue	92139-0122

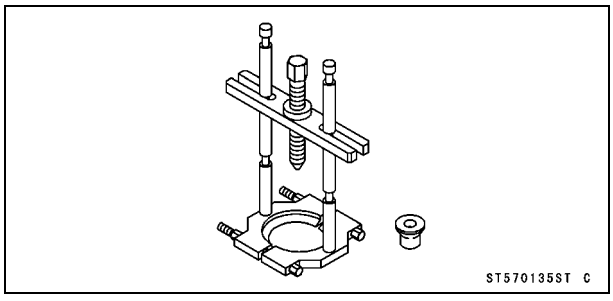
Crankshaft Main Bearing Insert Selection

Crankcase Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92139-0034	2, 4
			92139-0219	1, 3, 5
None	1	Black	92139-0033	2, 4
○	None		92139-0218	1, 3, 5
None	None	Blue	92139-0032	2, 4
			92139-0217	1, 3, 5

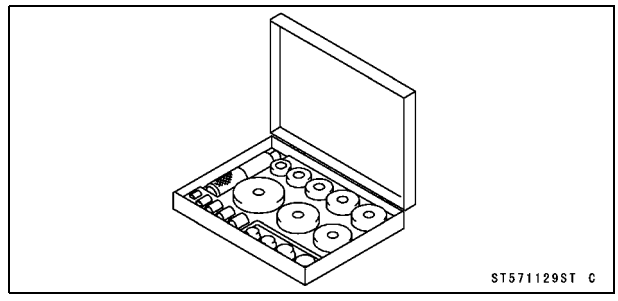
*: The bearing inserts for Nos. 2 and 4 journals have an oil groove, respectively.

Special Tools and Sealants

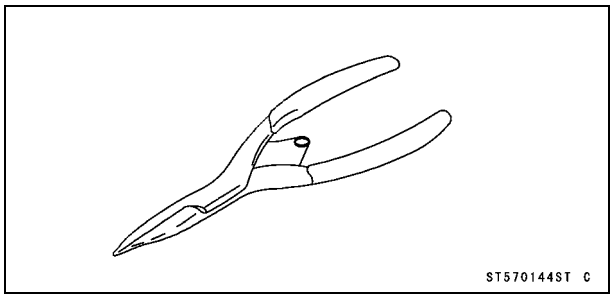
Bearing Puller:
57001-135



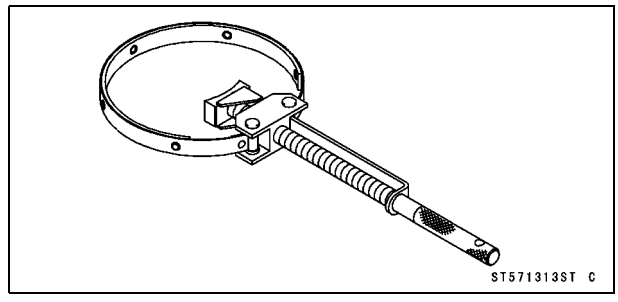
Bearing Driver Set:
57001-1129



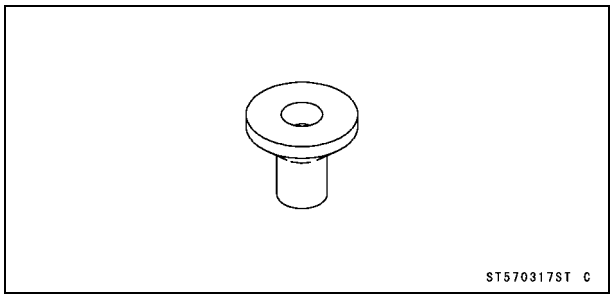
Outside Circlip Pliers:
57001-144



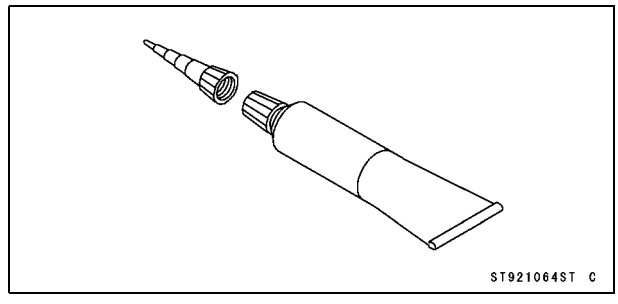
Flywheel Holder:
57001-1313



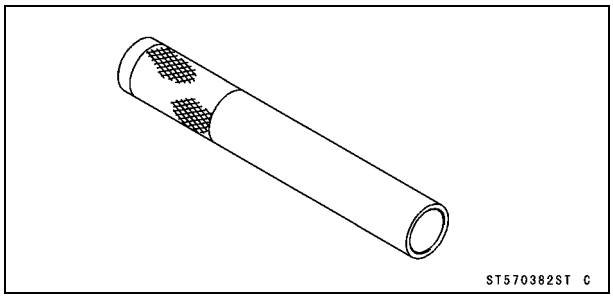
Bearing Puller Adapter:
57001-317



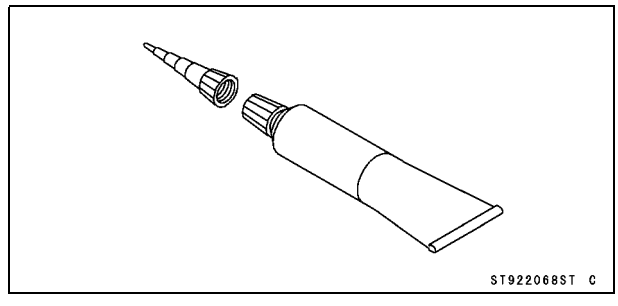
Liquid Gasket, TB1216B:
92104-1064



Bearing Driver, ϕ32:
57001-382



Liquid Gasket, TB1207B:
92104-2068



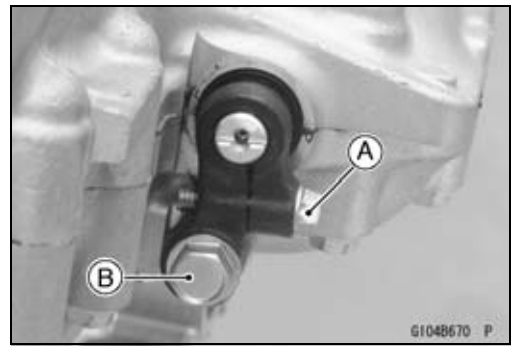
Crankcase Splitting

Crankcase Splitting

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:
  Cylinder (see Cylinder Removal in the Engine Top End chapter)
  Clutch (see Clutch Removal in the Clutch chapter)
  External Shift Mechanism (see External Shift Mechanism Removal)
  Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
  Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)
  Oil Cooler (see Oil Cooler Removal in the Engine Lubrication System chapter)
  Oil Pipe (see Oil Pipe Removal in the Engine Lubrication System chapter)
  Oil Pressure Relief Valve (see Oil Pressure Relief Valve Removal in the Engine Lubrication System chapter)

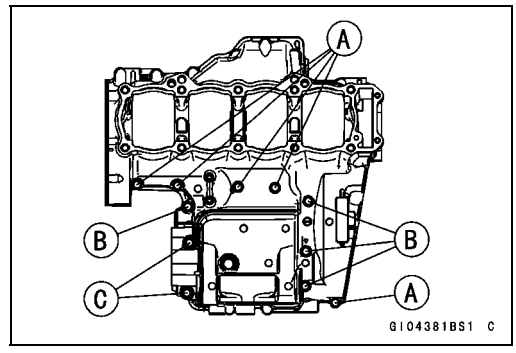
★If the crankshaft is to be removed, remove the pistons (see Piston Removal in the Engine Top End chapter).

- Remove:
  Balancer Shaft Clamp Bolt [A]
  Balancer Shaft Lever Bolt [B]



- Remove the upper crankcase bolts following the specified sequence.

○First, loosen the M6 bolts [A].
○Second, loosen the M7 bolts [B].
○Lasty, loosen the M8 bolts [C].



Crankcase Splitting

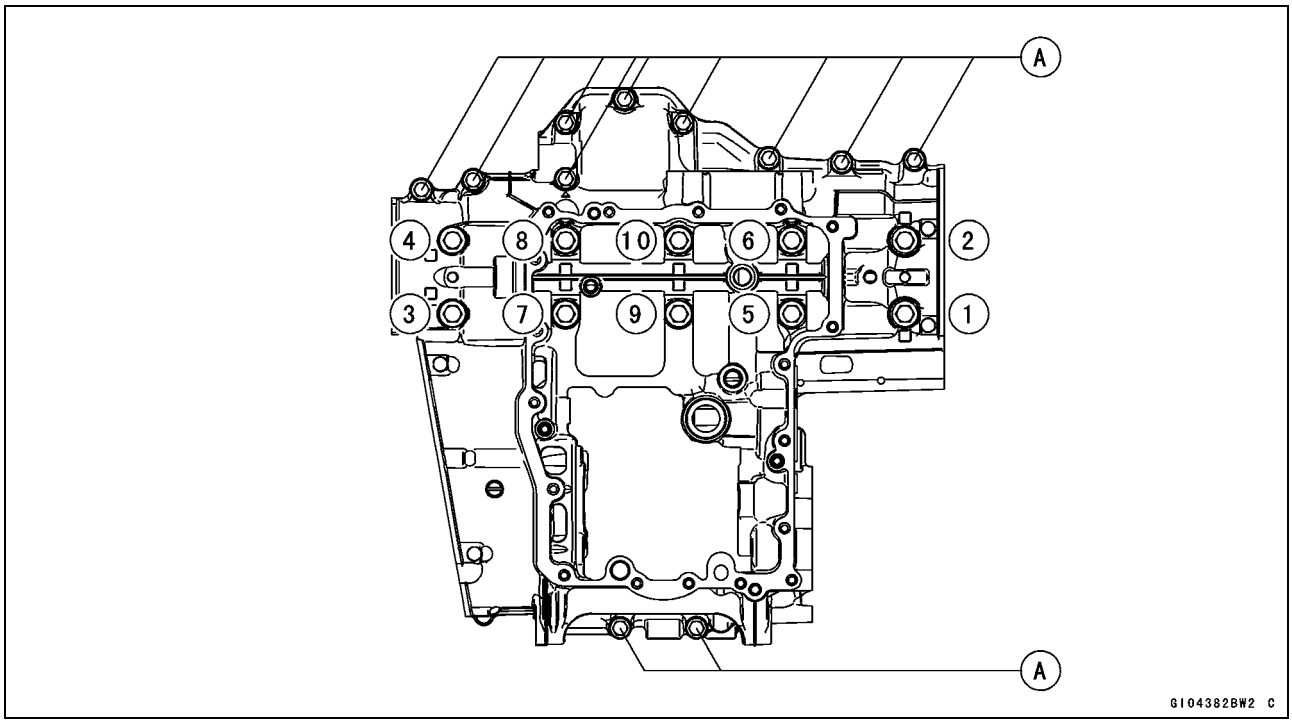
- Remove the lower crankcase bolts, following the specified sequence.

○First, loosen the M7 bolts [A].

○Lastly, loosen the M9 bolts as shown sequence [1 ~ 10] in the figure.

- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase.

○Take care not to damage the crankcase.



Crankcase Assembly

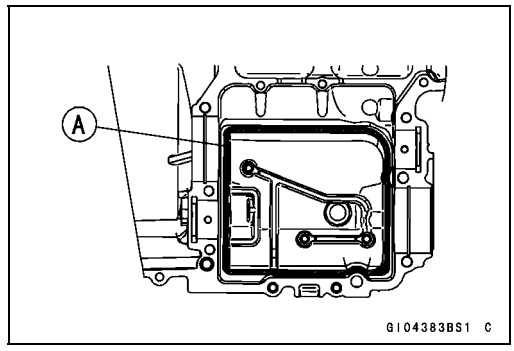
NOTICE

The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

- With a high flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
- Using compressed air, blow out the oil passages in the crankcase halves.

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the breather plate mating surface [A] 1 mm (0.04 in.) or more thick, and then install the breather plate.

Sealant - Liquid Gasket, TB1207B: 92104-2068



NOTE

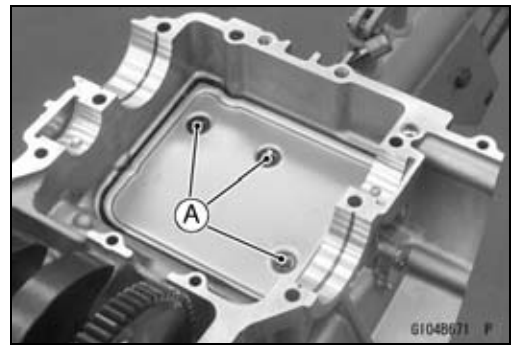
○*Make the application finish within 7 minutes when the liquid gasket to the mating surface of the breather plate is applied.*

○*Moreover fit the plate and tighten the bolts just after application of the liquid gasket.*

Crankcase Splitting

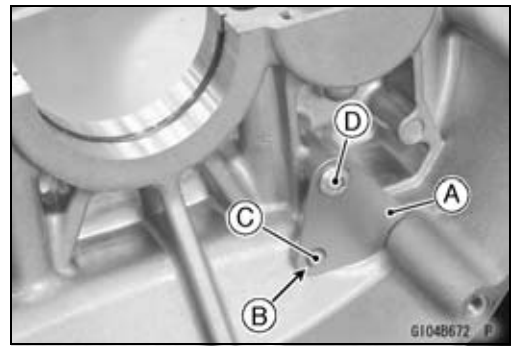
- Apply a non-permanent locking agent to the threads of the breather plate bolts [A] and tighten them.

  Torque - Breather Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



- Install the breather side plate [A] so that the plate hole [B] fit the projection [C] of the upper crankcase.
- Apply a non-parmanent locking agent to the threads of the breather side plate bolt [D] and tighten it.

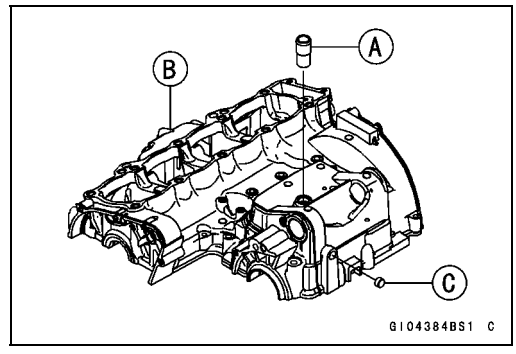
  Torque - Breather Side Plate Bolt: 5.9 N·m (0.60 kgf·m, 52 in·lb)



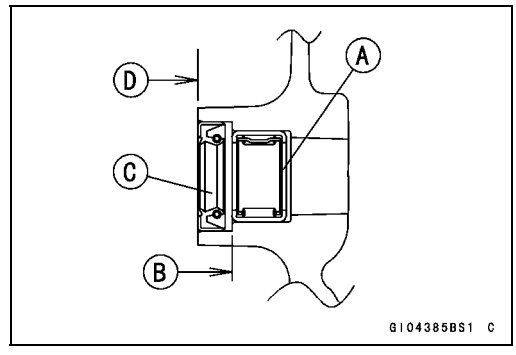
- Press and insert the fitting [A] in the upper crankcase [B] until it is bottomed.

  Special Tool - Bearing Driver Set: 57001-1129

- Press and insert the plug [C] in the upper crankcase so that the plug is deeper than crankcase surface.



- Press and insert the new needle bearing [A] for the shift shaft so that its marked side faces outside and its surface [B] is flush with the end of the hole.
- Install the new oil seal [C] so that its surface [D] is flush with the end of the hole.
- Apply grease to the oil seal lips.



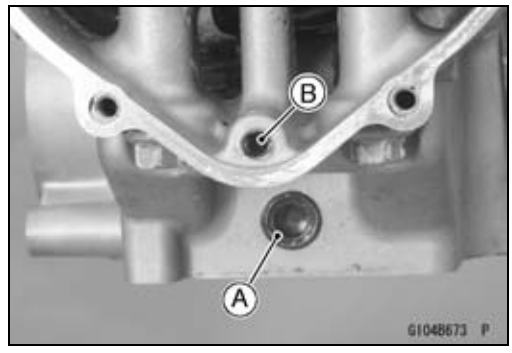
Crankcase Splitting

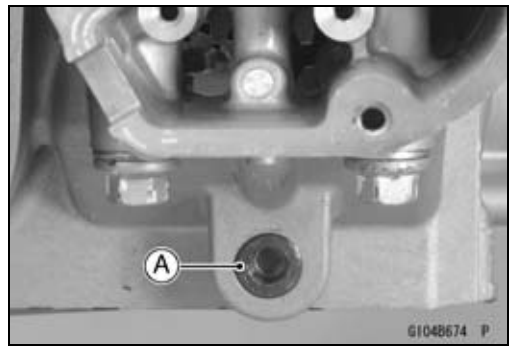
- Apply a non-parmanent locking agent to the oil passage plugs [A], and tighten them.

  Torque - Oil Passage Plugs: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Install the oil passage plug [B] in the lower crankcase, and tighten it.

  Torque - Oil Passage Plug: 9.8 N·m (1.0 kgf·m, 87 in·lb)

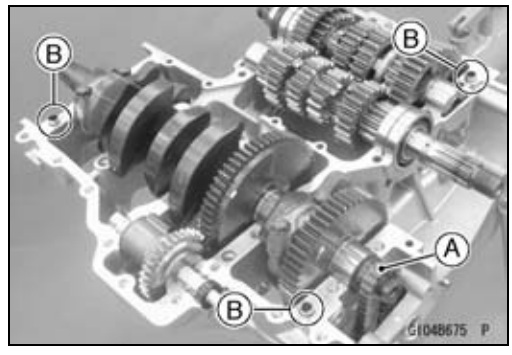




- Install:
  Crankshaft (see Crankshaft Installation)
  Connecting Rods (see Connecting Rod Installation)
  Camshaft Chain [A]
  Transmission Shafts and Gears (see Transmission Shaft Installation)
  Dowel Pins [B]
  Shift Drum (see Shift Drum and Fork Installation)
  Shift Forks and Shift Rods (see Shift Drum and Fork Installation)
- Before fitting the lower case on the upper case, check the following.

○Be sure to hang the camshaft chain on the crankshaft.

○Check to see that the shift drum and transmission gears are in the neutral position.



Crankcase Splitting

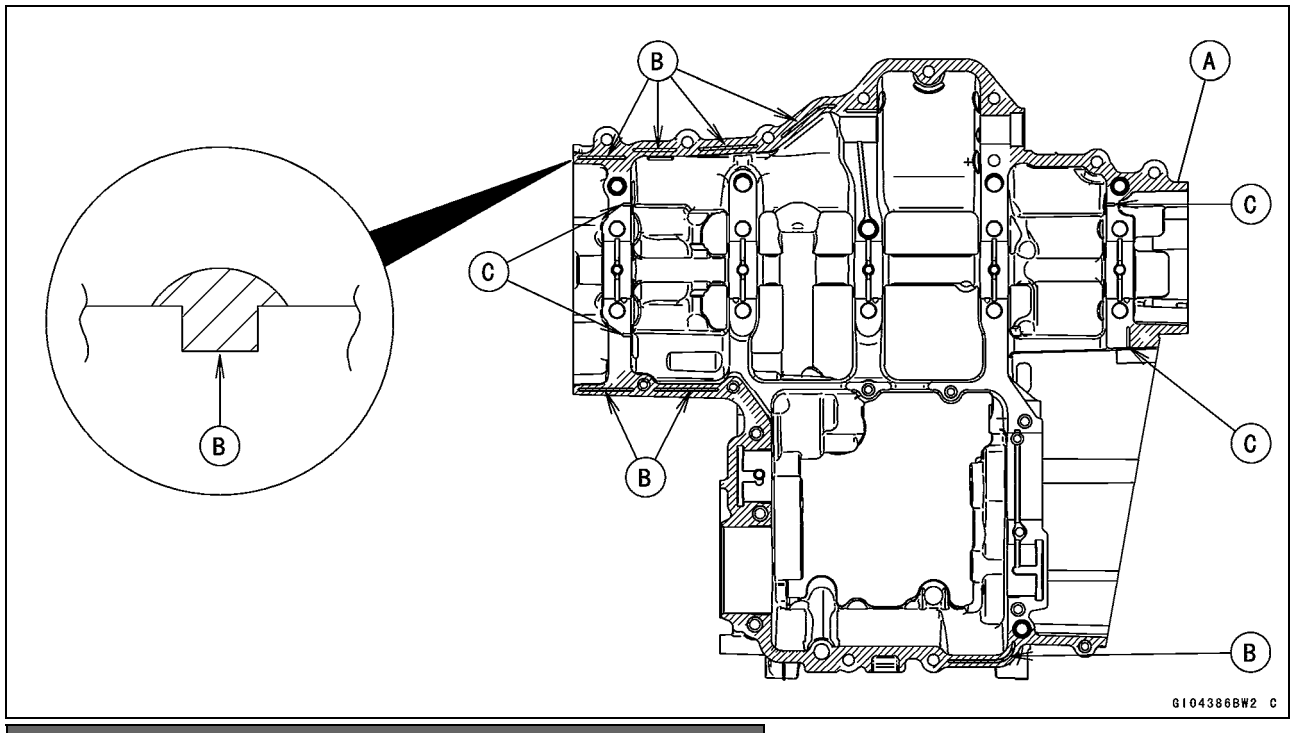
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the mating surface of the lower crankcase half.

Sealant - Liquid Gasket, TB1216B: 92104-1064

NOTE

○*Especially, apply a sealant so that it shall be filled up on the grooves [B].*

○*Do not apply liquid gasket to the inside of the groove [C].*



NOTICE

Do not apply liquid gasket around the crankshaft main bearing inserts and oil passage holes.

- Fit the lower crankcase to the upper crankcase.

NOTE

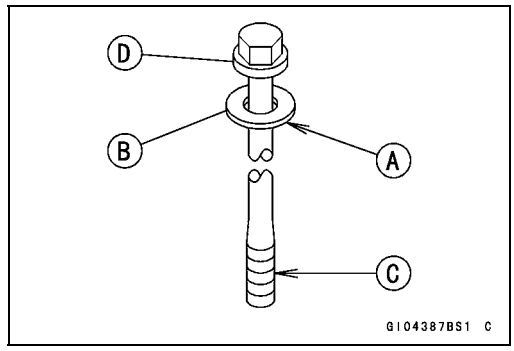
○*Make the application finish within 20 minutes when the liquid gasket to the mating surface of the crankcase half is applied.*

○*Moreover fit the case and tighten the bolts just after application of the liquid gasket.*

- The M9 bolts have copper plated washers, replace them with new ones.

Crankcase Splitting

● Apply molybdenum disulfide oil solution to the lower seating surface [A] on the copper plated washer [B] and threads [C] of the M9 bolts [D].



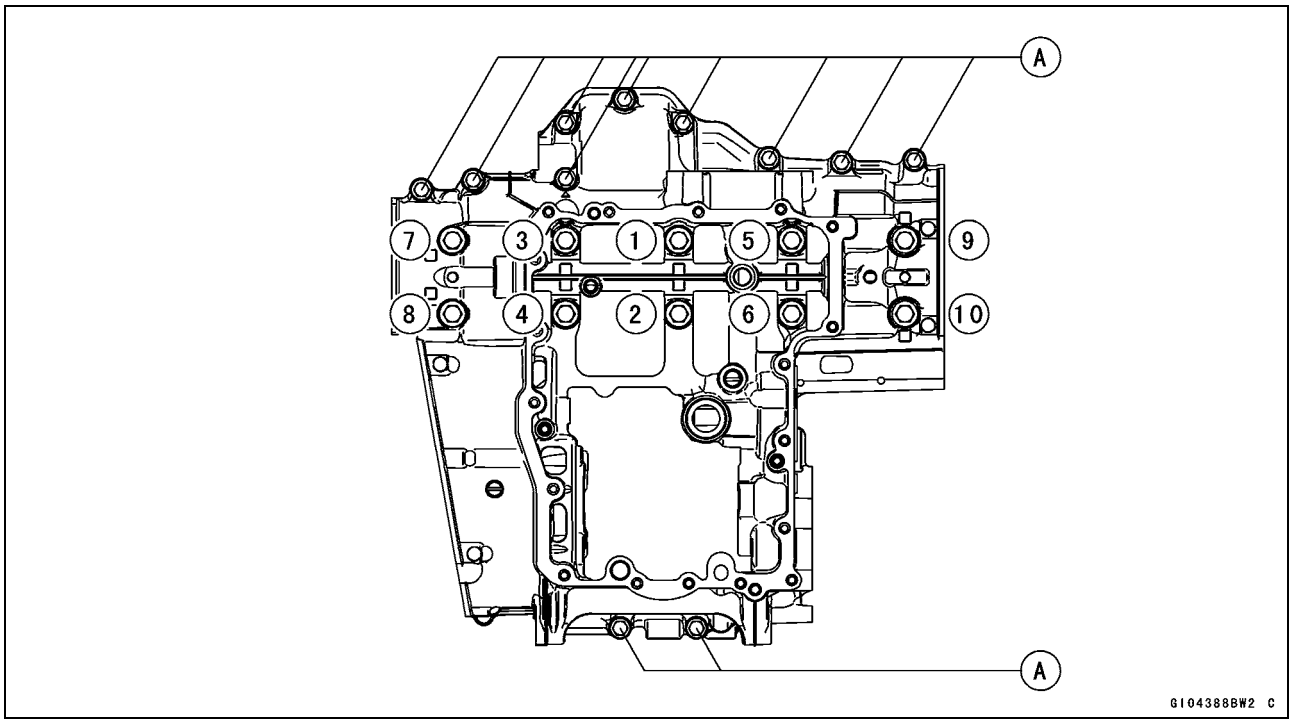
● Tighten the lower crankcase bolts using the following steps.

○Following the sequence numbers on the lower crankcase half, tighten the M9 bolts [1 ~ 10] with copper plated washers.

Torque - Crankcase Bolts (M9): 42 N·m (4.3 kgf·m, 31 ft·lb)

○Tighten the M7 bolts [A].

Torque - Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)



● Tighten the upper crankcase bolts follow in the specified sequence.

○First, tighten the M8 bolts [A].

Torque - Crank Case Bolts (M8): 27 N·m (2.8 kgf·m, 20 ft·lb)

○Second, tighten the M7 bolts.

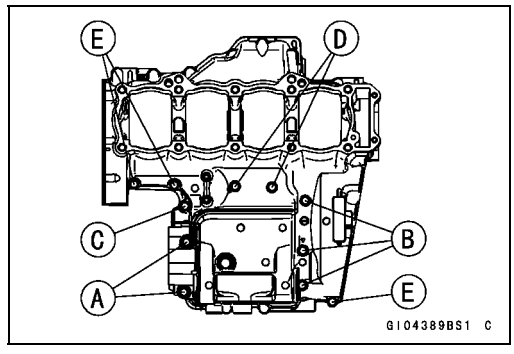
L = 85 mm (3.35 in.) [B]
L = 50 mm (1.97 in.) [C]

Torque - Crank Case Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)

○Lasty, tighten the M6 bolts.

L = 68 mm (2.69 in.) [D]
L = 40 mm (1.57 in.) [E]

Torque - Crank Case Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)



Crankcase Splitting

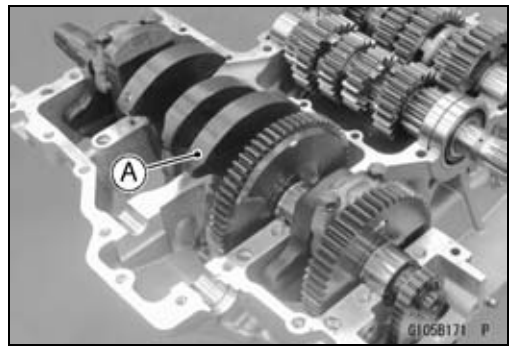
- After tightening all crankcase bolts, check the following items.

○Wipe up the liquid gasket that seeps out around the crankcase mating surface.
○Crankshaft and transmission shafts turn freely.
○While spinning the output shaft, gears shift smoothly from the 1st to 6th gear, and 6th to 1st.
○When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.

- Install the removed parts (see appropriate chapters).

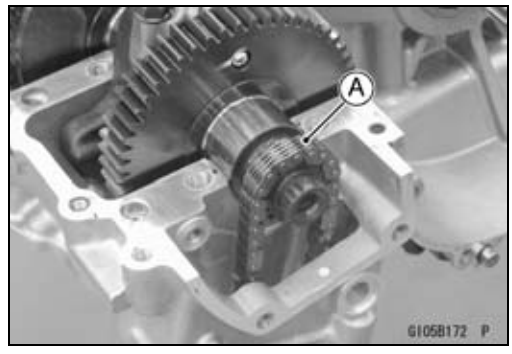
Crankshaft and Connecting Rods

Crankshaft Removal



- Split the crankcase (see Crankcase Splitting).
- Remove:
  Balancer (see Balancer Removal)
  Crankshaft [A]

Crankshaft Installation

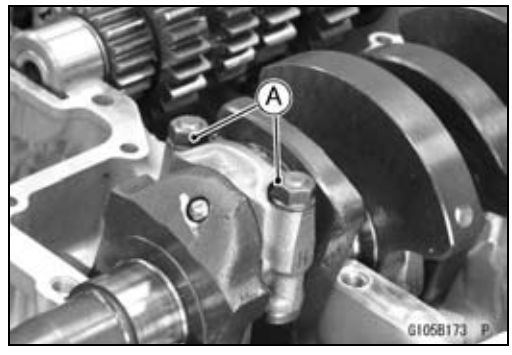


NOTICE

If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

- Apply molybdenum disulfide oil solution to the crankshaft main bearing inserts.
- Install the crankshaft with the camshaft chain [A] hanging on it.
- Install the balancer (see Balancer Installation).

Connecting Rod Removal



- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod big end nuts [A].
- Remove the crankshaft.

NOTE

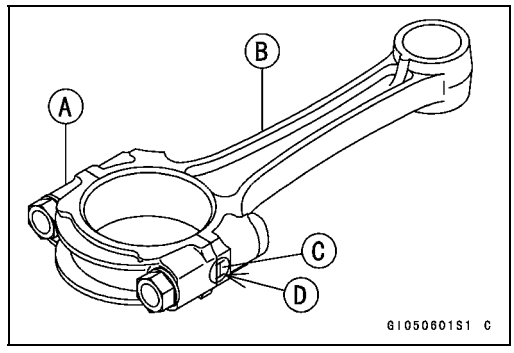
○*Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.*

- Remove the connecting rods from the crankshaft.

NOTICE

Discard the connecting rod bolts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

Connecting Rod Installation



NOTICE

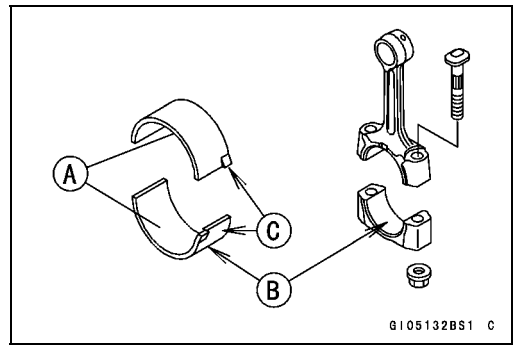
To minimize vibration, the connecting rods should have the same weight mark.

Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark [D]: "○" or no mark

NOTICE

If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

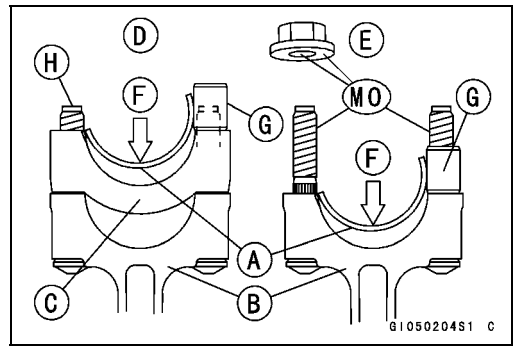
Crankshaft and Connecting Rods



- Apply molybdenum disulfide oil solution [A] to the inner surfaces of upper and lower bearing inserts.
- Do not apply any grease or oil to the cap inside and cap insert outside [B].
- Install the inserts so that their nails [C] are on the same side and fit them into the recess of the connecting rod and cap.

NOTICE

Wrong application of oil and grease could cause bearing damage.



○When installing the inserts [A], be careful not to damage the insert surface with the edge of the connecting rod [B] or the cap [C]. One way to install inserts is as follows.
Installation [D] to Cap
Installation [E] to Connecting Rod
Push [F]
Spare Dowel Pin [G]
Connecting Rod Bolts [H]

- Install the cap on the connecting rod, aligning the weight and diameter marks.
- Remove debris and clean the surface of inserts.
- Apply molybdenum disulfide oil solution [MO] to the threads and seating surfaces of the big end nuts and bolts.

- Install the crankshaft (see Crankshaft Installation).
- Install each connecting rod on its original crankpin.

○The connecting rod big end is bolted using the “plastic region fastening method”.

○This method precisely achieves the needed clamping force without exceeding it unnecessarily, allowing the use of thinner, lighter bolts further decreasing connecting rod weight.

○There are two types of the plastic region fastening. One is a bolt length measurement method and other is a rotation angle method. Observe one of the following two, but the bolt length measurement method is preferable because this is a more reliable way to tighten the big end nuts.

NOTICE

The connecting rod bolts are designed to stretch when tightened. Never reuse the connecting rod bolts. See the table below for correct bolt and nut usage.

NOTICE

Be careful not to overtighten the nuts.
The bolts must be positioned on the seating surface correctly to prevent the bolt heads from hitting the crankcase.

Crankshaft and Connecting Rods

(1) Bolt Length Measurement Method

● Be sure to clean the bolts, nuts, and connecting rods thoroughly with a high flash-point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

⚠ WARNING

Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean them.

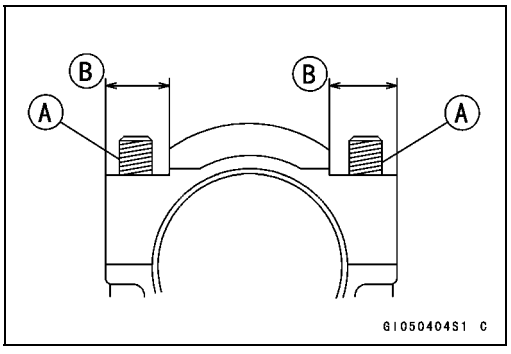
NOTICE

Immediately dry the bolts and nuts with compressed air after cleaning.
Clean and dry the bolts and nuts completely.

● Install new bolts and nuts in reused connecting rod.

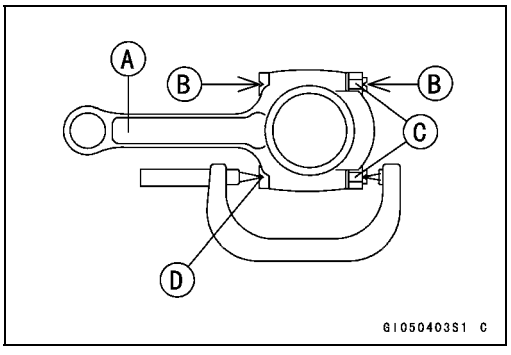
★If the connecting rod assy was replaced, use the bolts and nuts attached to the new connecting rod assy.

● Apply a small amount of molybdenum disulfide oil solution to the following portions.
Threads [A] of Bolts and Nuts
Seating Surfaces [B] of Nuts and Connecting Rod Caps



● Dent both bolt head and bolt tip with a punch as shown in the figure.

● Before tightening, use a point micrometer to measure the length of new connecting rod bolts and record the values to find the bolt stretch.
Connecting Rod [A]
Dent here with a punch [B].
Nuts [C]
Fit micrometer pins into dents [D].



● Tighten the big end nuts until the bolt elongation reaches the length specified as follows.

Bolt Length after tightening − Bolt Length before tightening = Bolt Stretch

Connecting Rod Bolt Stretch
Usable Range: 0.20 ~ 0.32 mm (0.0079 ~ 0.0126 in.)

● Check the length of the connecting rod bolts.

★If the stretch is more than the usable range, the bolt has stretched too much. An overelongated bolt may break in use.

Crankshaft and Connecting Rods

(2) Rotation Angle Method

★If you do not have a point micrometer, you may tighten the nuts using the “Rotation Angle Method”.

● Be sure to clean the bolts, nuts and connecting rods thoroughly with a high flash-point solvent, because the new connecting rods, bolts and nuts are treated with an anti -rust solution.

⚠ WARNING

Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash point solvent to clean them.

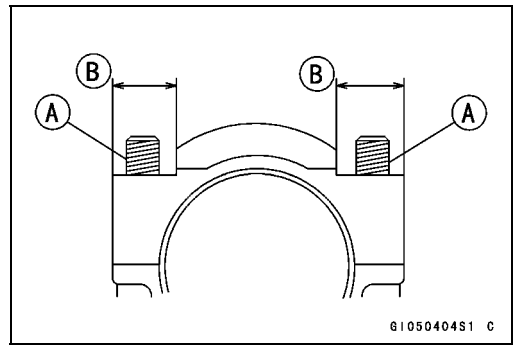
NOTICE

Immediately dry the bolts and nuts with compressed air after cleaning.
Clean and dry the bolts and nuts completely.

● Install new bolts and nuts in reused connecting rods.

★If the connecting rod assy was replaced, use the bolts and nuts attached to the new connecting rod assy.

● Apply a small amount of molybdenum disulfide oil solution to the following portions.
Threads [A] of Bolts and Nuts
Seating Surfaces [B] of Nuts and Connecting Rod Caps

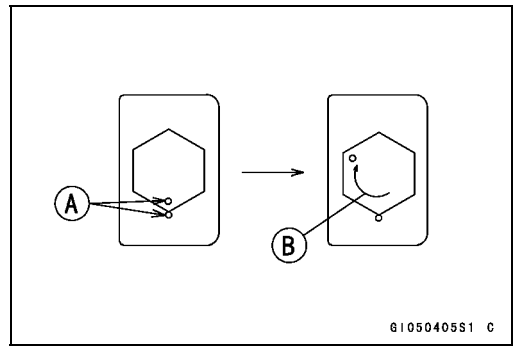


● First, tighten the nuts to the specified torque. See the table below.

● Next, tighten the nuts **120° ±5°** .

○Mark [A] the connecting rod big end caps and nuts so that nuts can be turned 120° [B] properly.

○Tighten the hexagon nut by 2 corners.



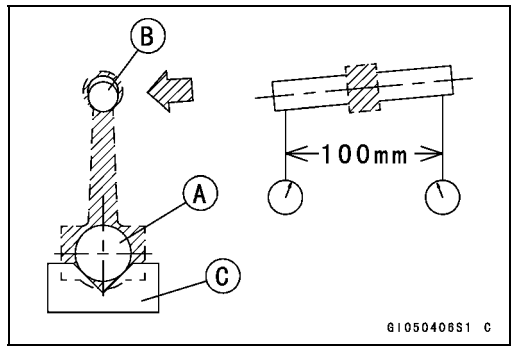
Connecting Rod Assy	Bolt	Nut	Torque + Angle N·m (kgf·m, ft·lb)
New	Use the bolts attached to new con-rod.	Attached to new con-rod	22 (2.2, 16) + 120°
		New	20 (2.0, 15) + 120°
Used	Replace the bolts with new ones.	Used	26 (2.7, 19) + 120°
		New	26 (2.7, 19) + 120°

Crankshaft and Connecting Rods

Crankshaft/Connecting Rod Cleaning

- After removing the connecting rods from the crankshaft, clean them with a high flash-point solvent.
- Blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.

Connecting Rod Bend Inspection

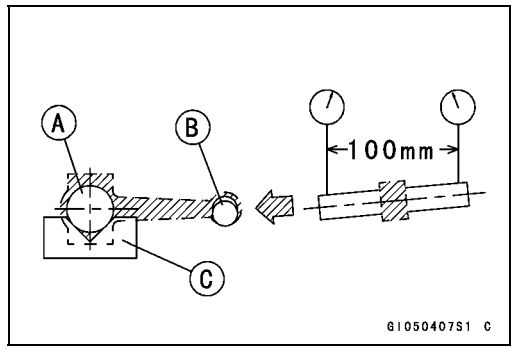


- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on V block [C].
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.

★If connecting rod bend exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Bend
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

Connecting Rod Twist Inspection

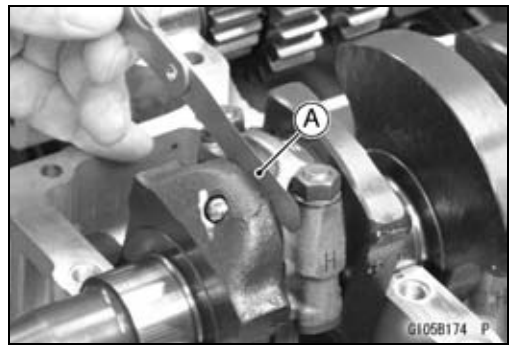


- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.

★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

Connecting Rod Big End Side Clearance Inspection



- Measure connecting rod big end side clearance.

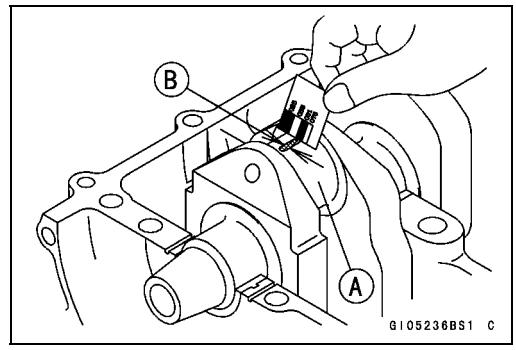
○Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

Connecting Rod Big End Side Clearance
Standard: 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)
Service Limit: 0.58 mm (0.023 in.)

★If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

Crankshaft and Connecting Rods

Connecting Rod Big End Bearing Insert/Crankpin Wear Inspection



- Measure the bearing insert/crankpin [A] clearance with plastigage (press gauge) [B].
- Tighten the big end nuts to the specified torque (see Connecting Rod Installation).

NOTE

○*Do not move the connecting rod and crankshaft during clearance measurement.*

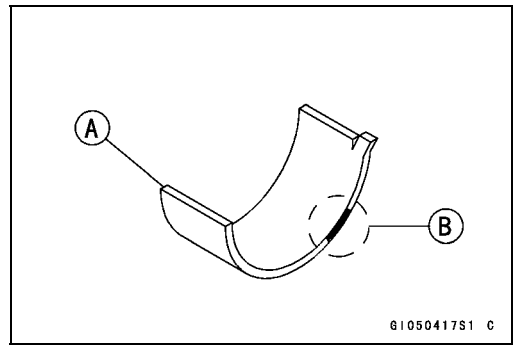
NOTICE

After measurement, replace the connecting rod bolts.

Connecting Rod Big End Bearing Insert/Crankpin Clearance

Standard: 0.030 ~ 0.060 mm (0.0012 ~ 0.0024 in.)

Service Limit: 0.10 mm (0.0039 in.)



★If the clearance is within the standard, no bearing replacement is required.

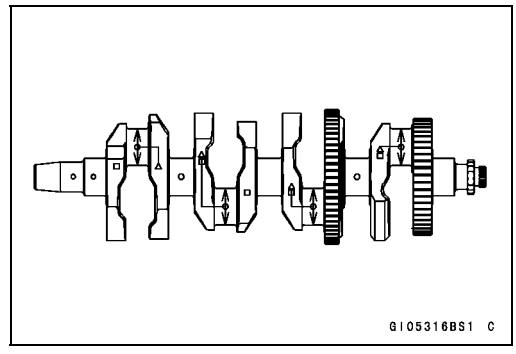
★If the clearance is between 0.061 mm (0.0024 in.) and the service limit (0.10 mm, 0.0039 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/crankpin clearance with the plastigage (press gauge). The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★If the clearance exceeds the service limit, measure the diameter of the crankpins.

Crankpin Diameter

Standard: 34.484 ~ 34.500 mm (1.3576 ~ 1.3583 in.)

Service Limit: 34.47 mm (1.357 in.)



★If any crankpin has worn past the service limit, replace the crankshaft with a new one.

★If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankpin Diameter Marks

None 34.484 ~ 34.492 mm (1.3576 ~ 1.3579 in.)

○ 34.493 ~ 34.500 mm (1.3580 ~ 1.3583 in.)

△: Crankpin Diameter Marks, "○" or no mark.

Crankshaft and Connecting Rods

- Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

NOTE

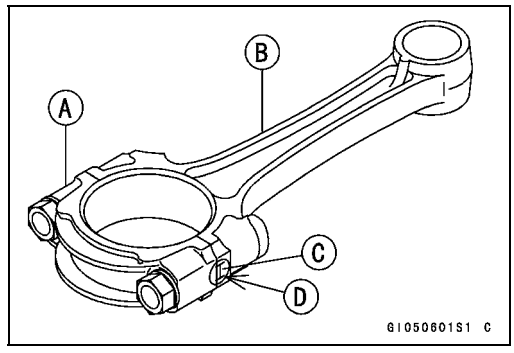
○*The mark already on the big end should almost coincide with the measurement.*

Connecting Rod Big End Inside Diameter Marks

None 37.500 ~ 37.508 mm (1.4764 ~ 1.4766 in.)

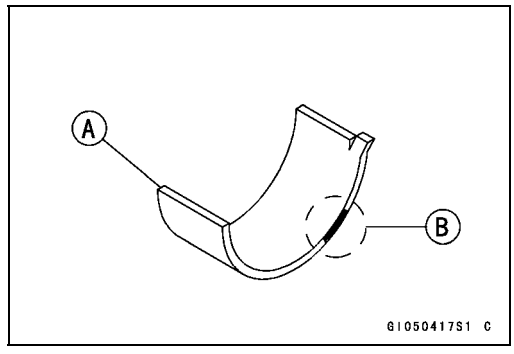
○ 37.509 ~ 37.516 mm (1.4767 ~ 1.4770 in.)

Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark (Around Weight Mark) [D]: "○" or no mark



- Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding. Size Color [B]

Con-rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-0124
None	None	Black	92139-0123
○	○		
○	None	Blue	92139-0122



- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage (press gauge).

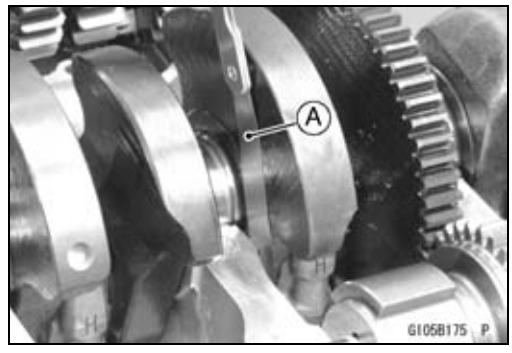
Crankshaft Side Clearance Inspection

- Insert a thickness gauge [A] between the crankcase main bearing and the crank web at the No.3 journal to determine clearance.

★If the clearance exceeds the service limit, replace the crankcase halves as a set.

NOTE

○*The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.*



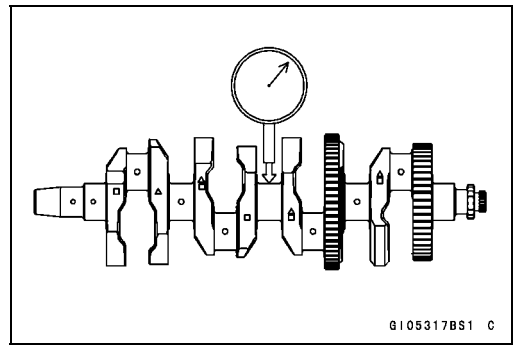
Crankshaft Side Clearance

Standard: 0.09 ~ 0.19 mm (0.0035 ~ 0.0075 in.)

Service Limit: 0.39 mm (0.0153 in.)

Crankshaft and Connecting Rods

Crankshaft Runout Inspection



● Measure the crankshaft runout.

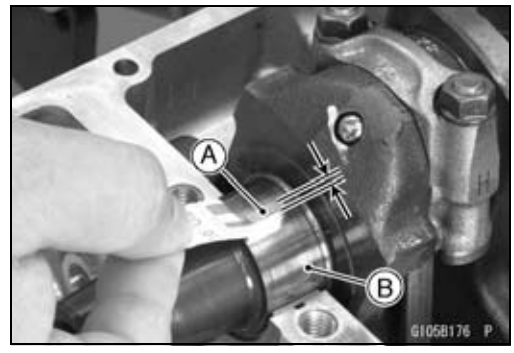
★If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

Standard: TIR 0.02 mm (0.0008 in.) or less

Service Limit: TIR 0.05 mm (0.0020 in.)

Crankshaft Main Bearing Insert/Journal Wear Inspection



● Using a plastigage (press gauge) [A], measure the bearing insert/journal [B] clearance.

NOTE

○*Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).*

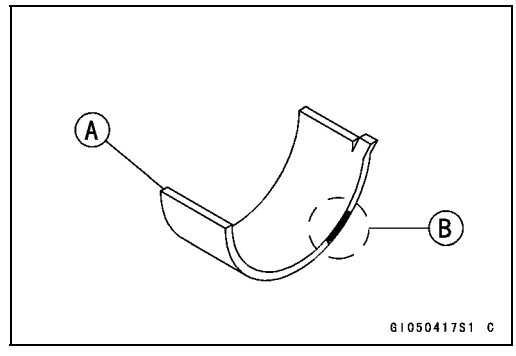
○*Do not turn the crankshaft during clearance measurement.*

○*Journal clearance less than 0.025 mm (0.00098 in.) can not be measured by plastigage (press gauge), however, using genuine parts maintains the minimum standard clearance.*

Crankshaft Main Bearing Insert/Journal Clearance

Standard: 0.010 ~ 0.034 mm (0.0004 ~ 0.0013 in.)

Service Limit: 0.06 mm (0.0024 in.)



★If the clearance is within the standard, no bearing replacement is required.

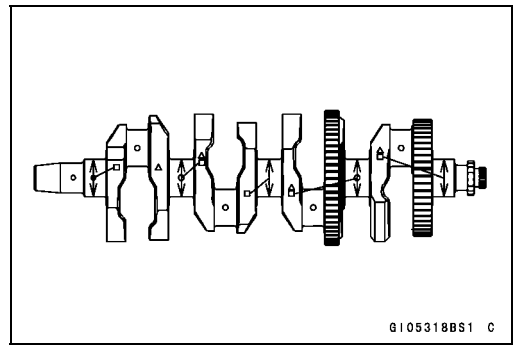
★If the clearance is between 0.035 mm (0.0014 in.) and the service limit (0.06 mm, 0.0024 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/journal clearance with the plastigage (press gauge). The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

Crankshaft Main Journal Diameter

Standard: 34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.)

Service Limit: 34.96 mm (1.3764 in.)



★If any journal has worn past the service limit, replace the crankshaft with a new one.

★If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankshaft Main Journal Diameter Marks

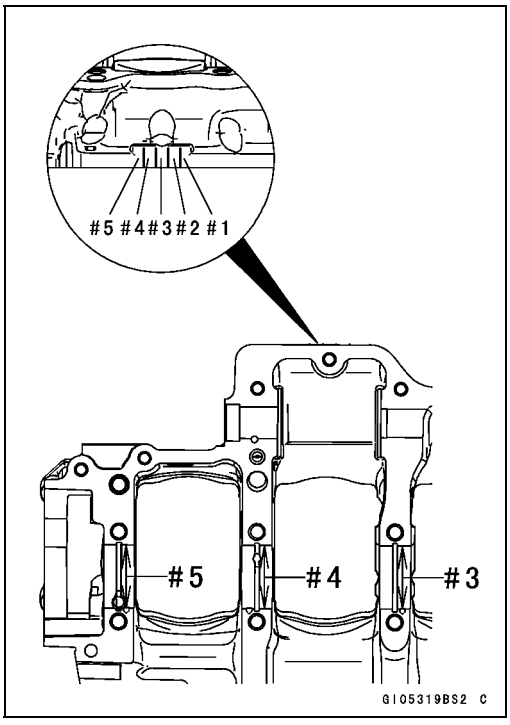
None 34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.)

1 34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.)

□: Crankshaft Main Journal Diameter Marks, “1” or no mark.

Crankshaft and Connecting Rods

- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.
  Crankcase Main Bearing Inside Diameter Marks: "○" or no mark.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).



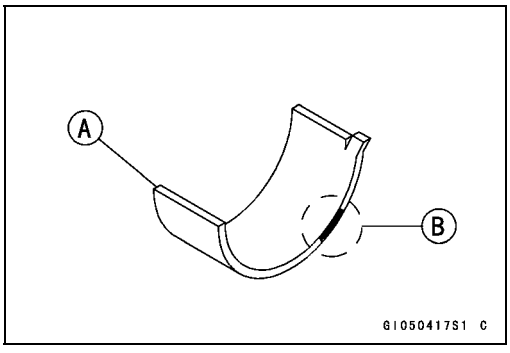
NOTE

○*The mark already on the upper crankcase half should almost coincide with the measurement.*

Crankcase Main Bearing Inside Diameter Marks

○	**38.000 ~ 38.008 mm (1.4961 ~ 1.4963 in.)**
None	**38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.)**

- Select the proper bearing insert [A] in accordance with the combination of the crankcase and crankshaft coding.
  Size Color [B]



Crankcase Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92139-0034	2, 4
			92139-0219	1, 3, 5
None	1	Black	92139-0033	2, 4
○	None		92139-0218	1, 3, 5
None	None	Blue	92139-0032	2, 4
			92139-0217	1, 3, 5

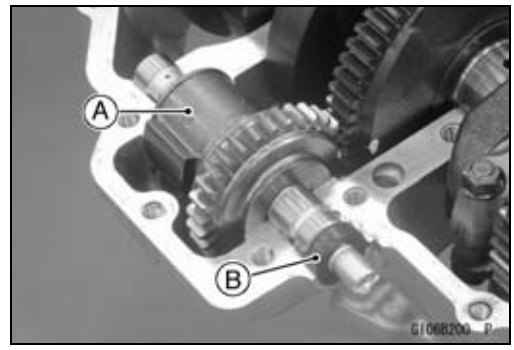
* The bearing inserts for Nos. 2 and 4 journals have an oil groove, respectively.

- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage (press gauge).

Balancer

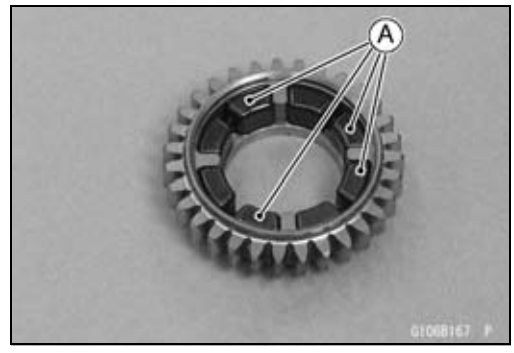
Balancer Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the balancer [A] from the upper crankcase half.
- Remove the oil seal [B].



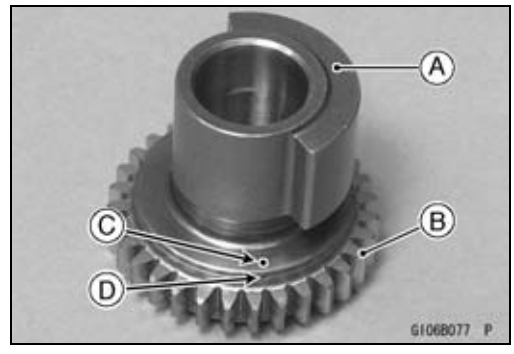
Balancer Installation

- Check that the rubber dampers [A] are in place as shown in the figure.

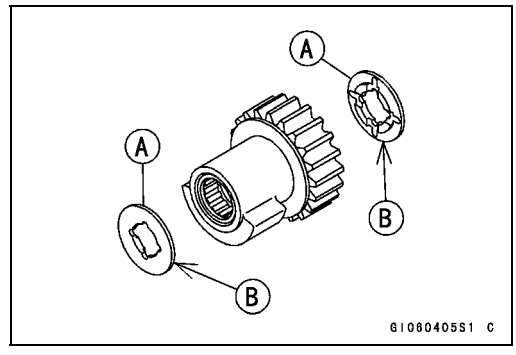


- Apply molybdenum disulfide oil solution to the damper contact portions of the balancer weight.
- Install the balancer weight [A] into the gear [B].

○Align the punch mark [C] of the balancer weight with the groove [D] of the gear.

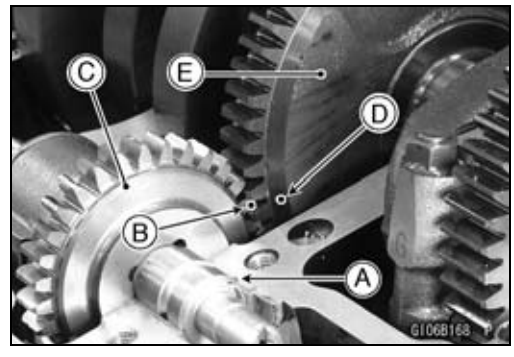


- Apply molybdenum disulfide oil solution to the needle bearings. Insert the needle bearings.
- Fit the copper washers [A] on both ends of the weight and gear assembly. The projected sides [B] face inward.



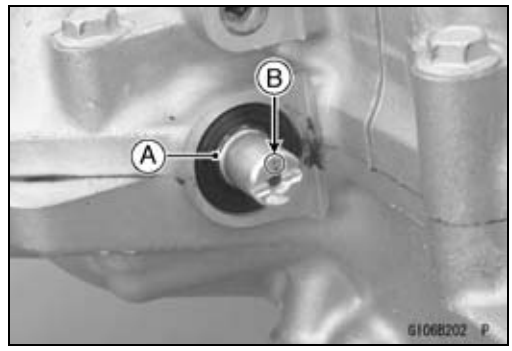
- Insert the pin [A] as shown in the figure.
- Set the balancer on the upper crankcase half.

○Align the punch mark [B] on the balancer gear [C] with the mark [D] on the balancer drive gear [E] of crankshaft.



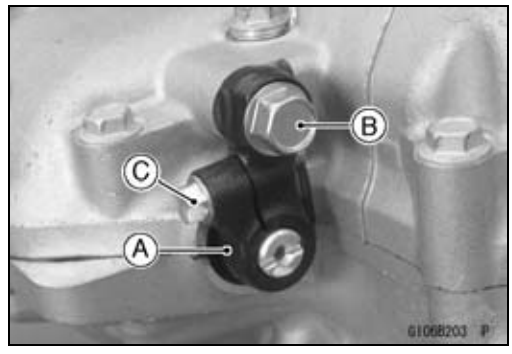
Balancer

- Assemble the crankcase (see Crankcase Assembly).
- Fill the oil seal lips with grease.
- Install the new oil seal [A] so that its surface is flush with the surface of the crankcase.
- Turn the balancer shaft so that its mark [B] faces downward (This photo is shown with the upside down).



- Install the balancer shaft lever [A].
- Apply a non-parmanent locking agent to the threads of the balancer shaft lever bolt [B].
- Tighten:

Torque - Balancer Shaft Lever Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)
Balancer Shaft Clamp Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

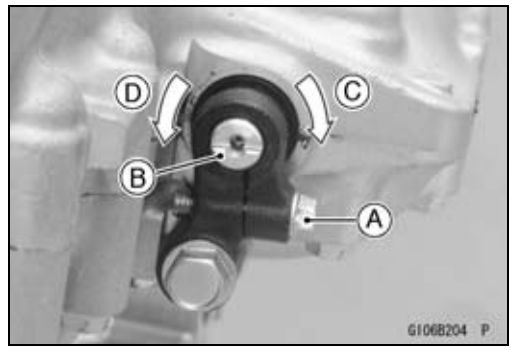


Balancer Adjustment

- Remove the lower fairing (see Lower Fairing Removal in the Frame chapter).
- Start the engine and warm it up thoroughly.
- Adjust the balancer gear backlash with the engine idling. The amount of backlash can be changed by turning the balancer shaft which has eccentric journals.

○Start the engine and let it idle.
○Loosen the clamp bolt [A] and turn the balancer shaft [B] clockwise [C] until the balancer gear makes a whining sound.
○Turn the shaft counterclockwise [D] until the balancer gear whining sound disappears and tighten the clamp bolt.

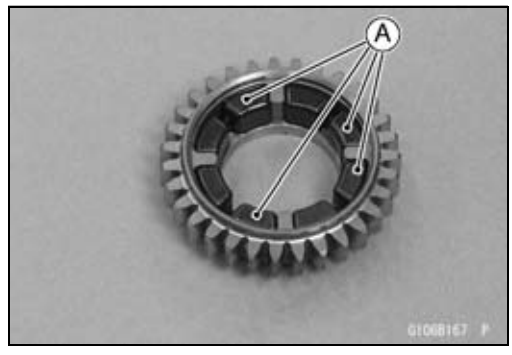
Torque - Balancer Shaft Clamp Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Balancer Damper Inspection

- Remove the balancer and disassemble the weight and gear assembly.
- Visually inspect the rubber dampers [A].

★If they appear damaged or deteriorated, replace them.



Starter Motor Clutch

Starter Motor Clutch Removal/Installation

- Refer to the Alternator Rotor Removal/Installation in the Electrical System chapter.

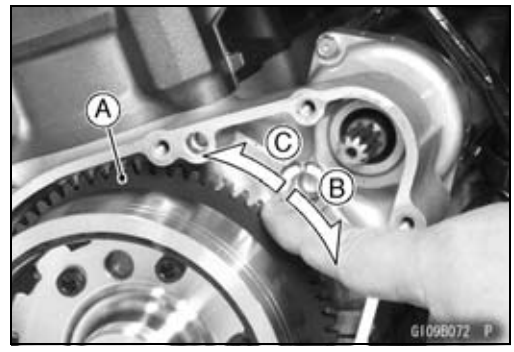
Starter Motor Clutch Inspection

- Remove:
  Alternator Cover (see Alternator Cover Removal in the Electrical System chapter)
  Starter Idle Gear and Shaft
- Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn clockwise [B] freely, but should not turn counterclockwise [C].

★If the starter motor clutch does not operate as it should or if it makes noise, go to the next step.

- Disassemble the starter motor clutch, and visually inspect the clutch parts.

★If there is any worn or damaged part, replace it.



NOTE

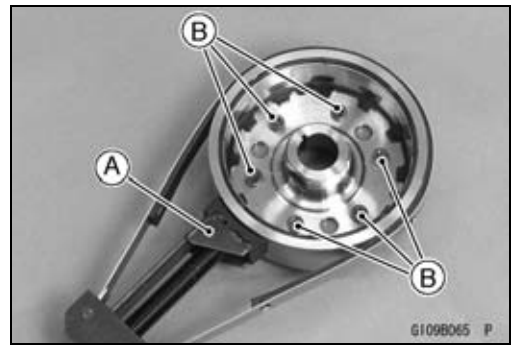
○*Examine the starter motor clutch gear as well. Replace it if it worn or damaged.*

Starter Motor Clutch Disassembly

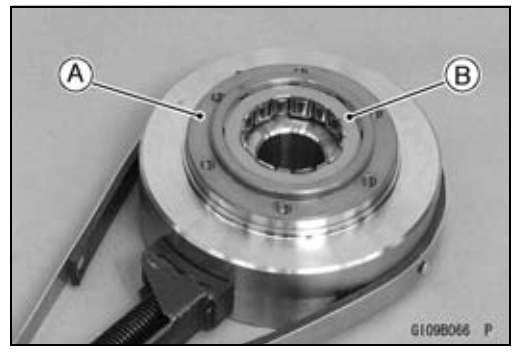
- Remove:
  Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
- Hold the alternator rotor with the flywheel holder [A].

Special Tool - Flywheel Holder: 57001-1313

- Remove the starter motor clutch bolts [B].



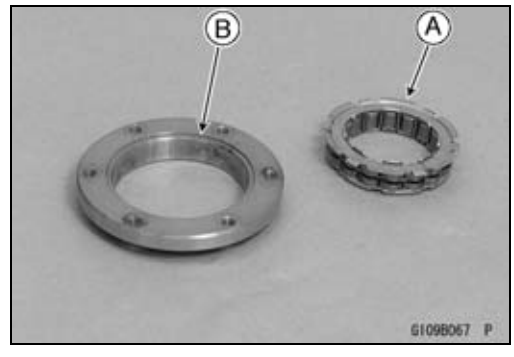
- Remove:
  Starter Motor Clutch Housing [A]
  Starter Motor Clutch [B]



Starter Motor Clutch Assembly

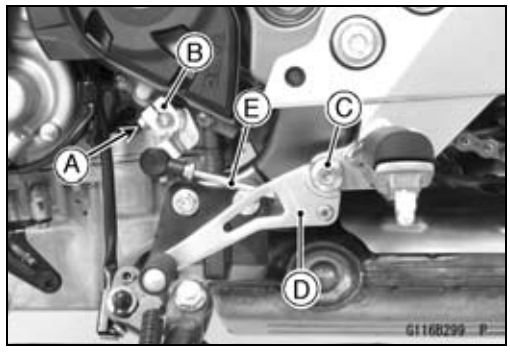
- Install the starter motor clutch to the housing so that the flange [A] fit to the housing groove [B].
- Apply a non-permanent locking agent to the threads of the starter motor clutch bolts and tighten them.

Torque - Starter Motor Clutch Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)



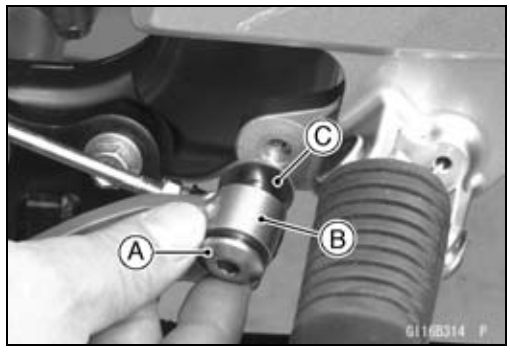
External Shift Mechanism

Shift Pedal Removal



- Remove:
  Shift Lever Bolt [A]
  Shift Lever [B]
  Shift Pedal Mounting Bolt [C]
  Shift Pedal [D] with Tie-rod [E]

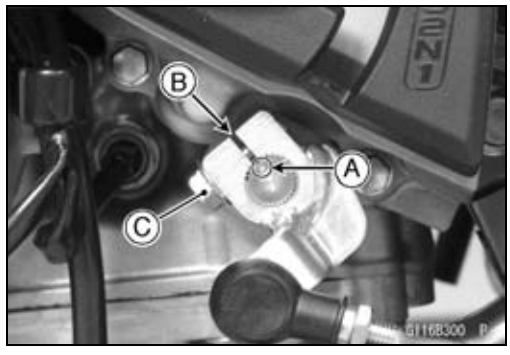
Shift Pedal Installation



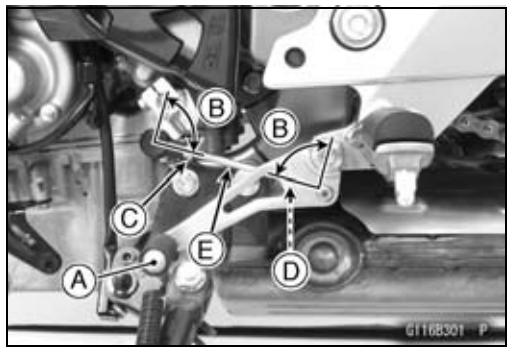
- Tighten:

  Torque - Shift Pedal Mounting Bolt [A]: 25 N·m (2.5 kgf·m, 18 ft·lb)

  Shift Pedal [B]
  Washer [C]



- Align the punch mark [A] on the shift shaft with the slit [B] of the shift lever.
- Tighten the shift lever bolt [C].

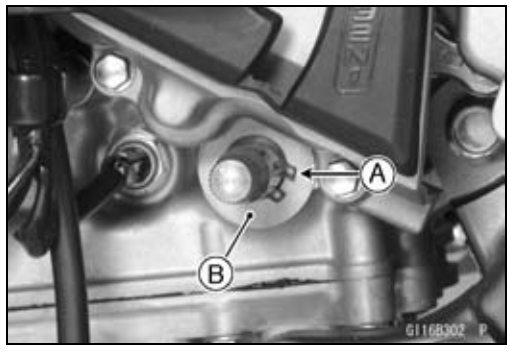


- After installation, confirm that the shift pedal [A] is positioned as shown in the figure.
  About 90° [B]

★If the pedal position is different, adjust it as follows.

○To adjust the pedal position, loosen the front locknut [C] (left-hand threads) and rear locknut [D], and then turn the tie-rod [E].

External Shift Mechanism Removal

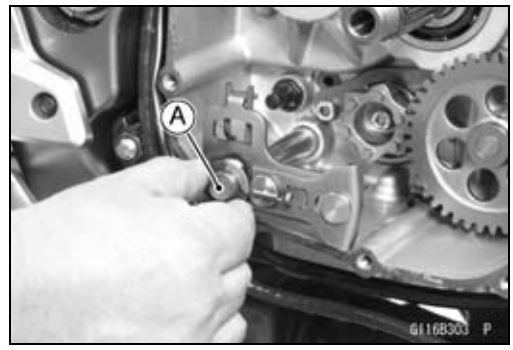


- Remove:
  Shift Lever (see Shift Pedal Removal)
  Circlip [A]
  Washer [B]
  Clutch (see Clutch Removal in the Clutch chapter)

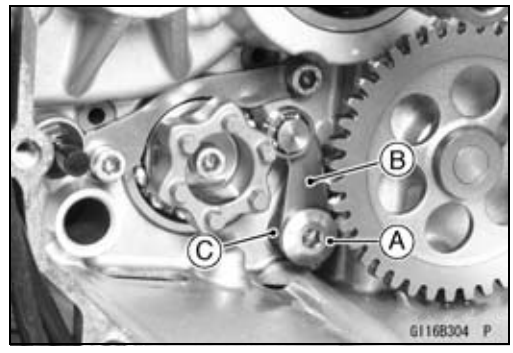
  Special Tool - Outside Circlip Pliers: 57001-144

External Shift Mechanism

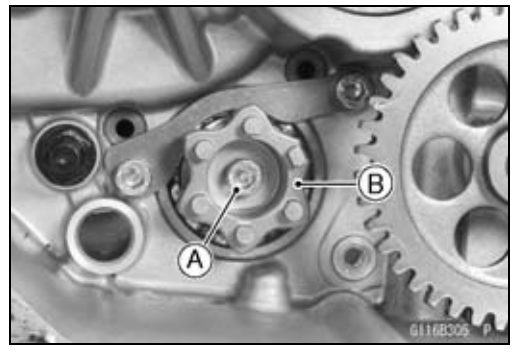
● Pull out the shift shaft assembly [A].



● Remove:
Gear Positioning Lever Bolt [A]
Gear Positioning Lever [B]
Collar and Spring [C]



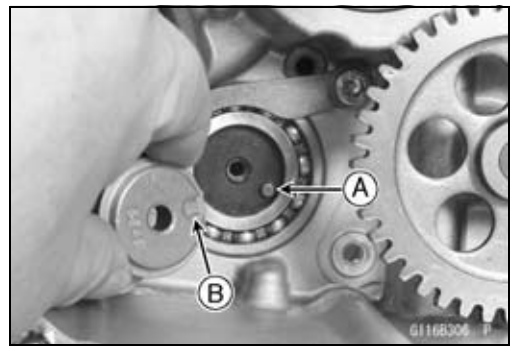
● Remove:
Shift Drum Cam Bolt [A]
Shift Drum Cam [B]



External Shift Mechanism Installation

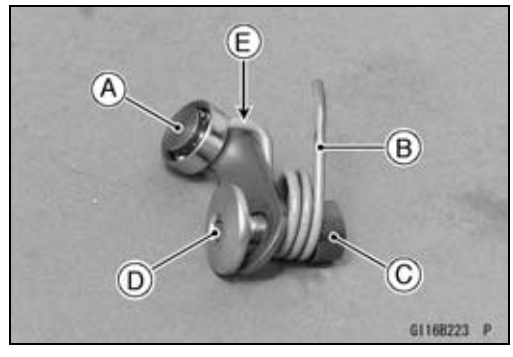
● Be sure to install the dowel pin [A].
● Align the dowel pin with the hollow [B] of the shift drum cam.
● Apply a non-permanent locking agent to the threads of the shift drum cam bolt, and tighten it.

Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)



● Assemble the following parts as shown.
[A] Gear Positioning Lever
[B] Spring
[C] Collar
[D] Gear Positioning Lever Bolt

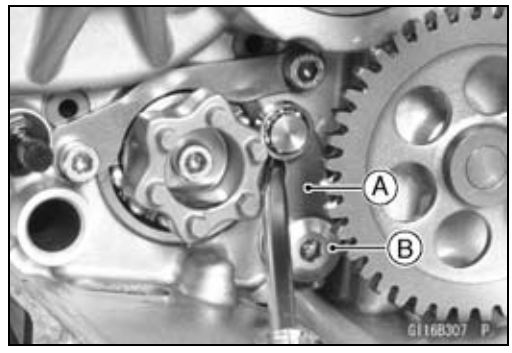
○Hang the spring end [E] to the gear positioning lever.



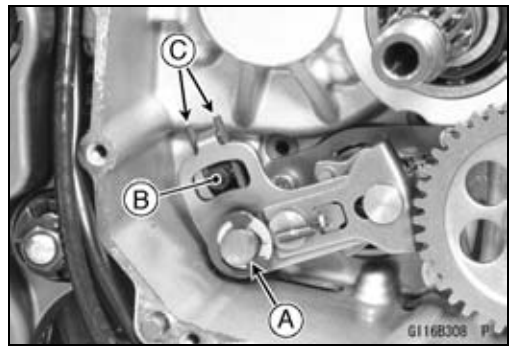
External Shift Mechanism

● While prying the gear positioning lever [A], tighten the gear positioning lever bolt [B].

Torque - Gear Positioning Lever Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)

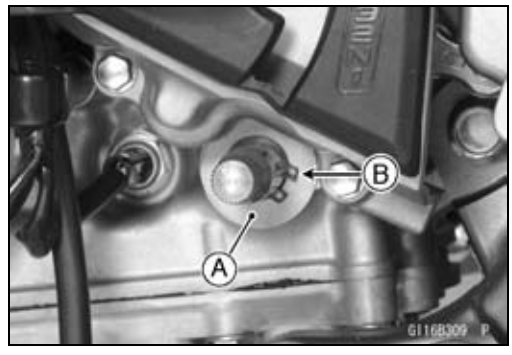


● Install the shift shaft [A] so that the return spring pin [B] fits between the spring [C].



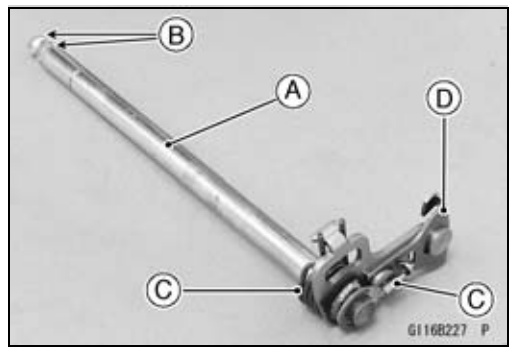
● Install the washer [A].
● Replace the circlip [B] with a new one, and install it.

Special Tool - Out side Circlip Pliers: 57001-144



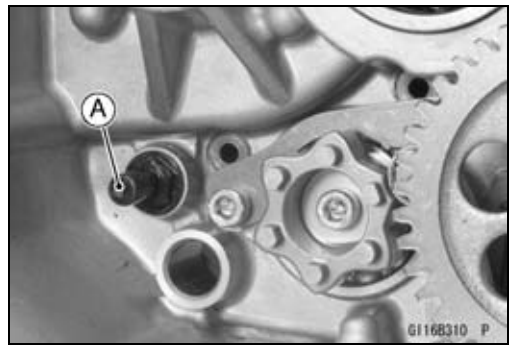
External Shift Mechanism Inspection

● Examine the shift shaft [A] for any damage.
★If the shaft is bent, straighten or replace it.
★If the serration [B] are damaged, replace the shaft.
★If the springs [C] are damaged in any way, replace them.
★If the shift mechanism arm [D] is damaged in any way, replace the shift shaft.



● Check the return spring pin [A] is not loose.
★If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

Torque - Shift Shaft Return Spring Pin: 39 N·m (4.0 kgf·m, 29 ft·lb)



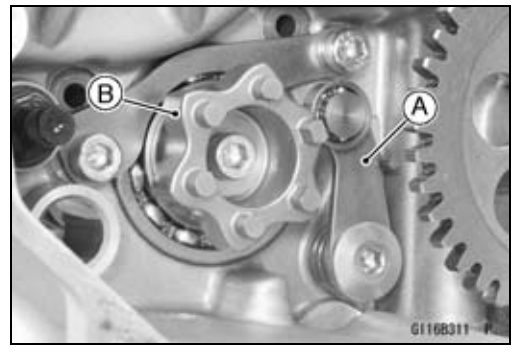
External Shift Mechanism

- Check the gear positioning lever [A] and its spring for breaks or distortion.

★If the lever or spring are damaged in any way, replace them.

- Visually inspect the shift drum cam [B].

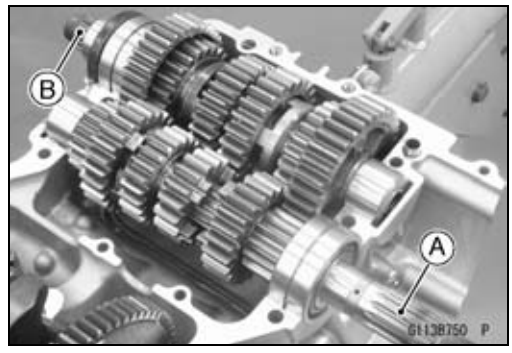
★If it is badly worn or shows any damage, replace it.



Transmission

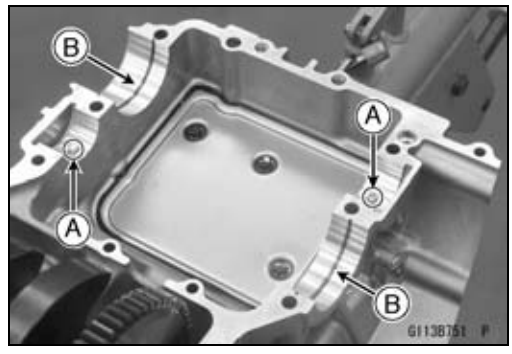
Transmission Shaft Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the drive shaft [A] and output shaft [B].



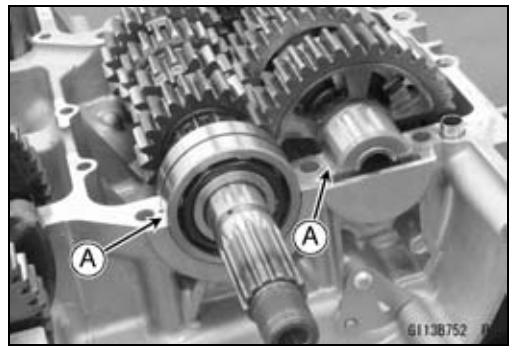
Transmission Shaft Installation

- Check to see that the set pins [A] and set rings [B] are in place.

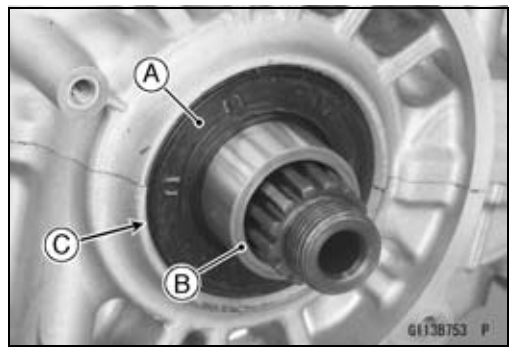


- Install the drive shaft and output shaft into the upper crankcase half.
- Apply engine oil to the bearings.

○The bearing set pins and rings must match properly with the holes or grooves in the bearing outer races. When they are properly matched, there is no clearance [A] between the crankcase and the bearing outer races.



- Assemble the crankcase (see Crankcase Assembly).
- Using a high flash-point solvent, clean off any oil or dirt from the outer circumference of the oil seal [A] and its matching surfaces of the crankcases. Wipe the solvent with a clean cloth.
- Apply high-temperature grease to the oil seal lips.
- Insert the collar [B] into the oil seal.
- Press in the oil seal into the crankcase so that the surface of the oil seal is flush with the surface [C] of the crankcase.



Transmission Shaft Disassembly

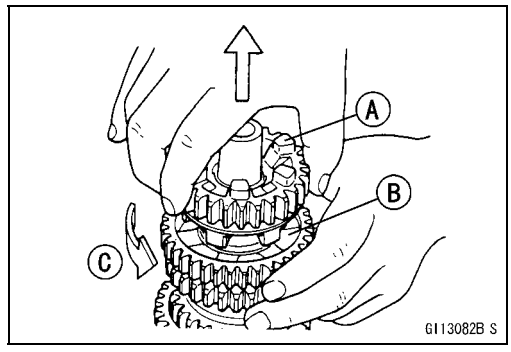
- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, and disassemble the transmission shafts.

Special Tool - Outside Circlip Pliers: 57001-144

- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.

○Set the output shaft in a vertical position holding the 3rd gear [B].

○Spin the 5th gear quickly [C] and pull it off upward.



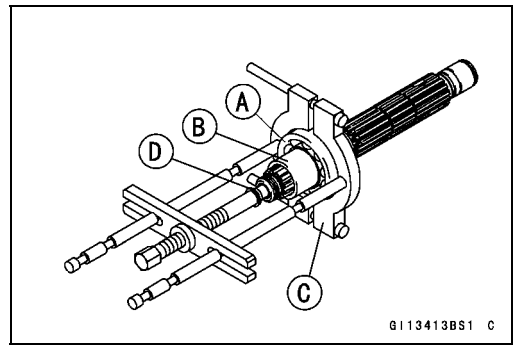
Transmission

● Remove the ball bearing [A] from each shafts.

Special Tools - Bearing Puller [C]: 57001-135
Bearing Puller Adapter [D]: 57001-317

● Discard the bearing.

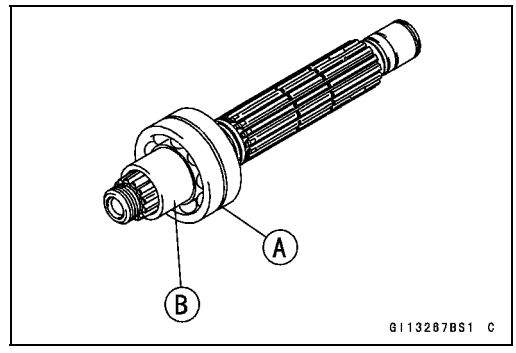
○For output shaft, remove the collar [B] together with the ball bearing.



Transmission Shaft Assembly

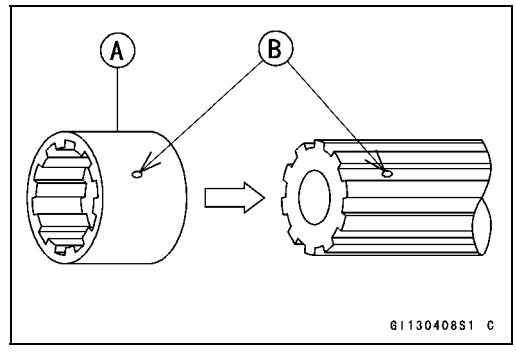
● Install the new ball bearing [A] and collar [B] (output shaft) on the each shaft, using the bearing driver.

Spacial Tool - Bearing Driver, ϕ32: 57001-382



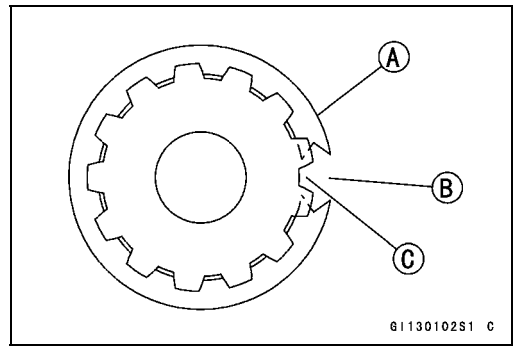
● Apply engine oil to the bushings, ball bearings and shafts.

● Install the gear bushings [A] on the shaft with their holes [B] aligned.



● Replace any circlips removed with new ones.

● Install the circlips [A] so that the opening [B] is aligned with a spline groove [C].



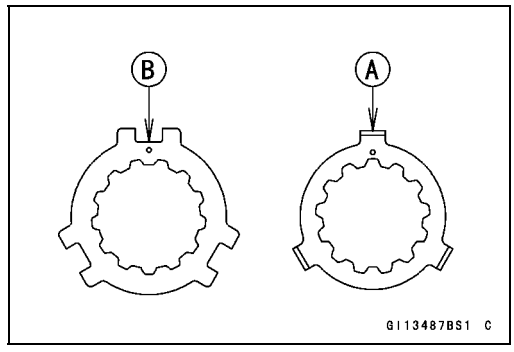
Transmission

- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 3rd/4th gear onto the drive shaft with their oil holes aligned.
- Install the 6th gear bushing onto the drive shaft with their oil holes aligned.
- The output shaft gears can be recognized by size: the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 6th gear onto the output shaft with their oil holes aligned.
- Install the 3rd/4th gear bushings onto the output shaft with their oil holes aligned.

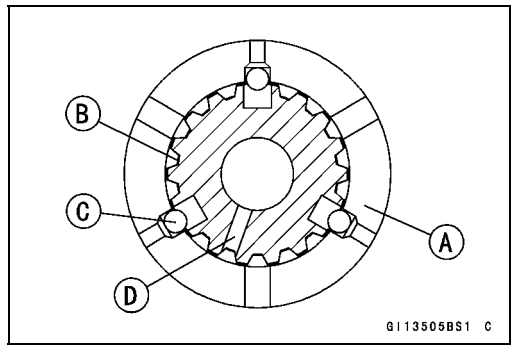
NOTE

○*When the toothed washers are assembled onto the output shaft, note the following.*

○*When the tangs [A] of the toothed washer shall be assembled, they should be installed into the notch [B] of the toothed washer (see Page 9-36).*



- Fit the steel balls into the 5th gear holes in the output shaft, aligning the hole as shown in the figure.
  5th Gear [A]
  Output Shaft [B]
  Steel Balls [C]
  Hole [D]



NOTICE

Do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.

○After assembling the 5th gear with steel balls in place on the output shaft, check the ball-locking effect that the 5th gear doesn't come out of the output shaft when moving it up and down by hand.

- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.

Transmission

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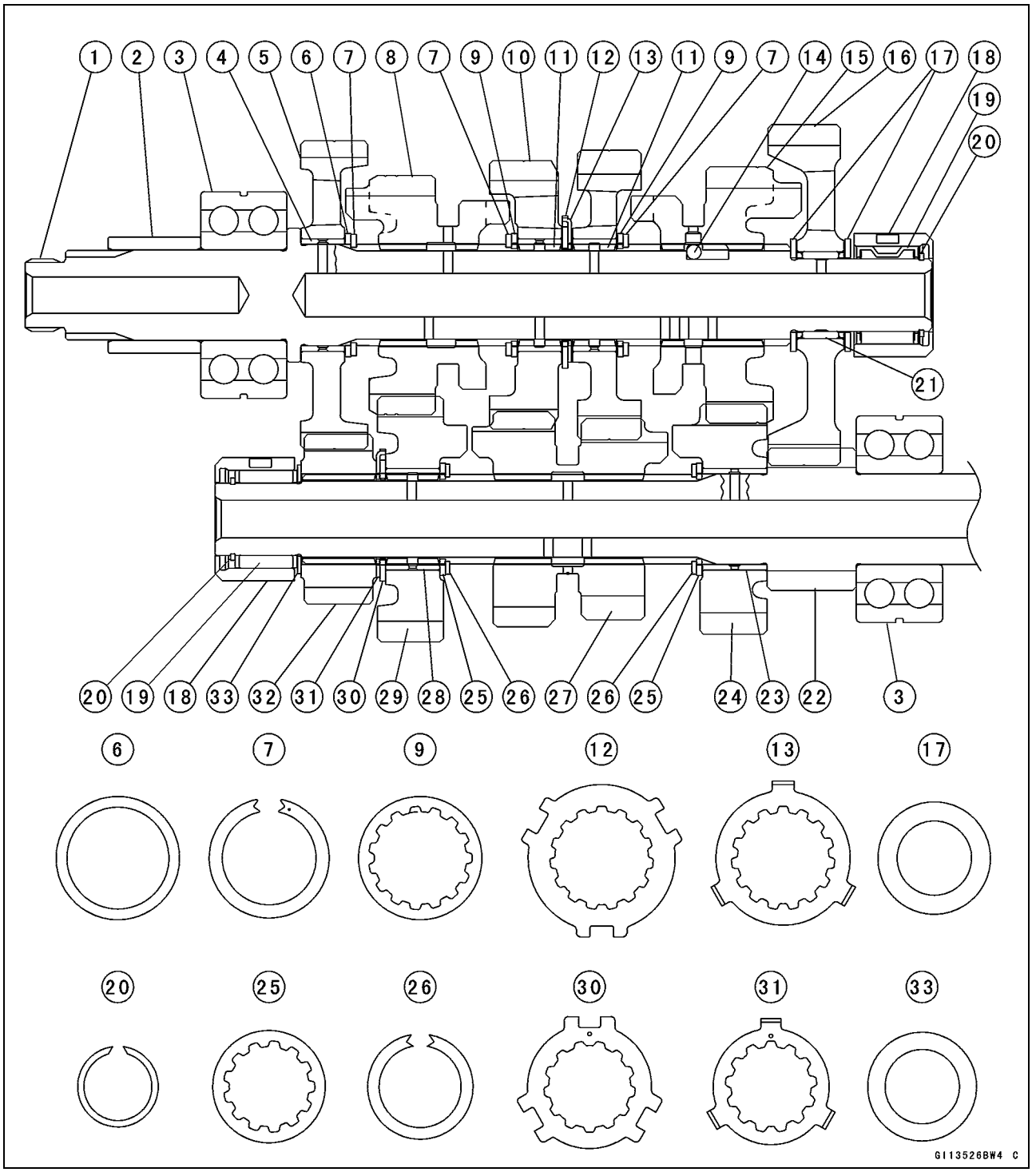
Transmission

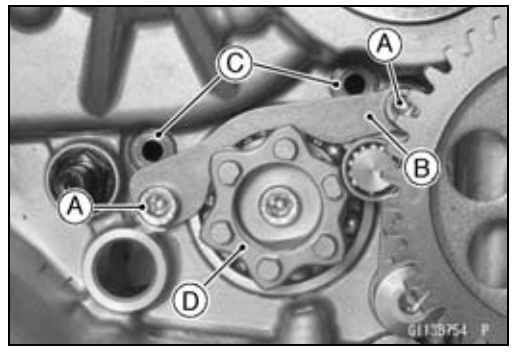


Transmission

1. Output Shaft
2. Collar
3. Bearing
4. Bushing
5. 2nd Gear (39 T)
6. Washer (ϕ34 × ϕ28.1)
7. Circlips (ϕ33 × ϕ25.9)
8. Top Gear (23 T)
9. Toothed Washer (ϕ34)
10. 4th/3rd Gear (30 T/26 T)
11. Bushing
12. Toothed Washer (ϕ40.5)
13. Toothed Washer (ϕ37)
14. Steel Balls
15. 5th Gear (25 T)
16. Low Gear (35 T)
17. Washers (ϕ31 × ϕ20.5)
18. Races
19. Needle Bearings
20. Circlips (ϕ22.2 × ϕ18.7)
21. Needle Bearing
22. Low Gear (13 T) (Drive Shaft)
23. Bushing
24. 5th Gear (22 T)
25. Toothed Washer (ϕ31)
26. Circlip (ϕ29 × ϕ22.6)
27. 3rd/4th Gear (17 T/23 T)
28. Bushing
29. Top Gear (24 T)
30. Toothed Washer (ϕ34.2)
31. Toothed Washer (ϕ32)
32. 2nd Gear (20 T)
33. Washer (ϕ30 × ϕ20.5)

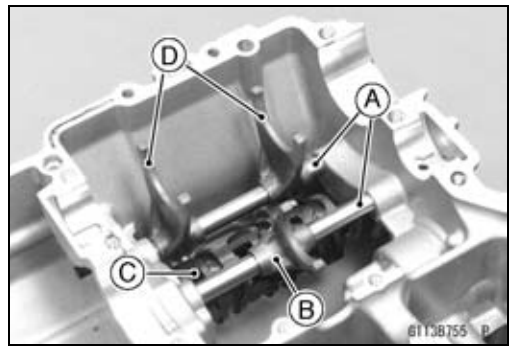
Transmission

Shift Drum and Fork Removal



- Remove:
  Lower Crankcase Half (see Crankcase Splitting)
  Transmission Shafts (see Transmission Shaft Removal)
  Gear Positioning Lever (see External Shift Mechanism Removal)
  Bolts [A]
  Shift Drum Bearing Holder [B]
- Pull out the shift rods [C], and take off the shift forks.
- Pull out the shift drum [D].

Shift Drum and Fork Installation



- Apply engine oil to the shift drum, forks and rods.
- Install the shift rods [A], noting the groove position.

○The rods are identical.

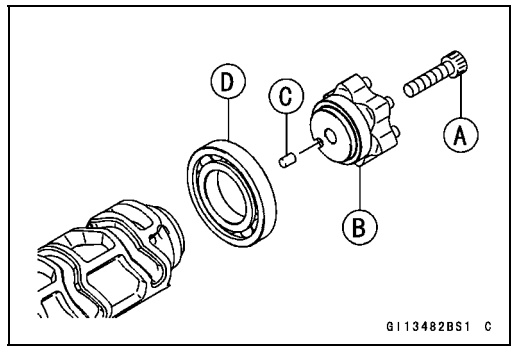
○Position the one with shortest ears [B] on the drive shaft and place the pin in the center groove in the shift drum [C].

○The two forks [D] on the output shaft are identical.

- Install the forks so that its “0061” and “0062” side faces engine left side.
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolts, and tighten them.

Torque - Shift Drum Bearing Holder Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

Shift Drum Disassembly



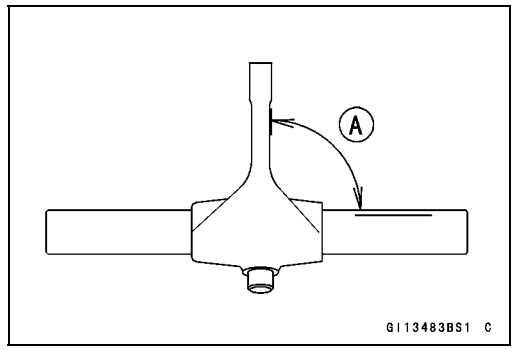
- Remove the shift drum (see Shift Drum and Fork Removal).
- While holding the shift drum with a vise, remove the shift drum cam bolt [A].
- Remove:
  Shift Drum Cam [B]
  Dowel Pin [C]
  Bearing [D]

Shift Drum Assembly

- Be sure to install the dowel pin.
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolt, and tighten it.

Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)

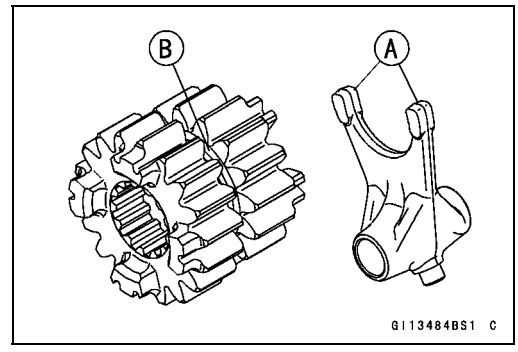
Shift Fork Bending Inspection



- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
  90° [A]

Transmission

Shift Fork/Gear Groove Wear Inspection



- Measure the thickness of the shift fork ears [A], and measure the width of the gear grooves [B].

★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

Shift Fork Ear Thickness

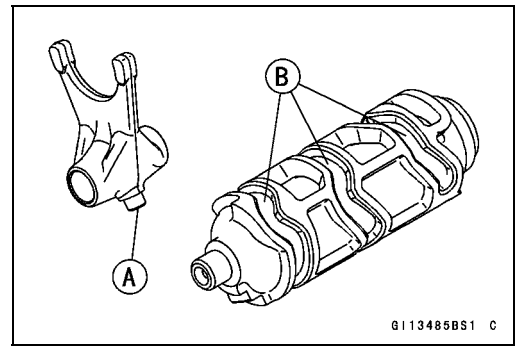
Standard:	**5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)**
Service Limit:	**5.8 mm (0.228 in.)**

★If the gear groove is worn over the service limit, the gear must be replaced.

Gear Groove Width

Standard:	**6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)**
Service Limit:	**6.25 mm (0.246 in.)**

Shift Fork Guide Pin/Drum Groove Wear Inspection



- Measure the diameter of each shift fork guide pin [A], and measure the width of each shift drum groove [B].

★If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

Shift Fork Guide Pin Diameter

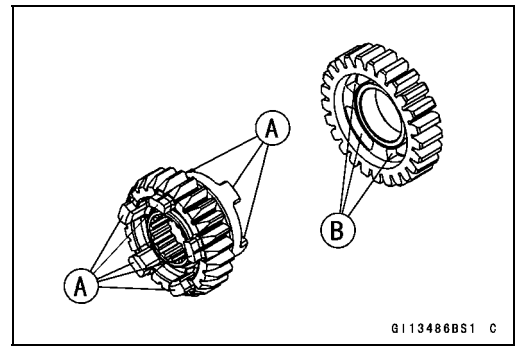
Standard:	**6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)**
Service Limit:	**6.8 mm (0.268 in.)**

★If any shift drum groove is worn over the service limit, the drum must be replaced.

Shift Drum Groove Width

Standard:	**7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)**
Service Limit:	**7.3 mm (0.287 in.)**

Gear Dog and Gear Dog Hole Damage Inspection



- Visually inspect the gear dogs [A] and gear dog holes [B].

★Replace any damaged gears or gears with excessively worn dogs or dog holes.

Ball Bearing, Needle Bearing, and Oil Seal

Ball and Needle Bearing Replacement

NOTICE

Do not remove the ball or needle bearings unless it is necessary. Removal may damage them.

● Using a press or puller, remove the ball bearing and/or needle bearings.

NOTE

○*In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max., and tapping the bearing in or out.*

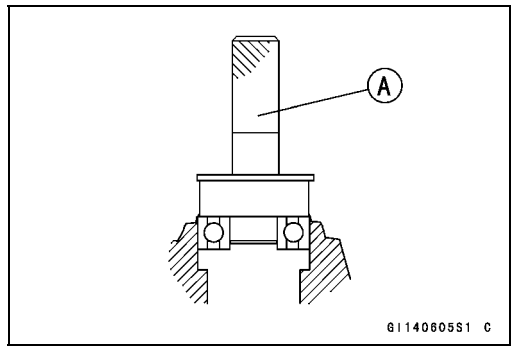
NOTICE

Do not heat the case with a torch. This will warp the case. Soak the case in oil and heat the oil.

● Using a press and the bearing driver set [A], install the new ball bearing until it stops at the bottom of its housing.

○The new needle bearings must be pressed into the crankcase so that the end is flush with the end of the hole.

Special Tool - Bearing Driver Set: 57001-1129



Ball and Needle Bearing Wear Inspection

NOTICE

Do not remove the bearings for inspection. Removal may damage them.

● Check the ball bearings.

○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

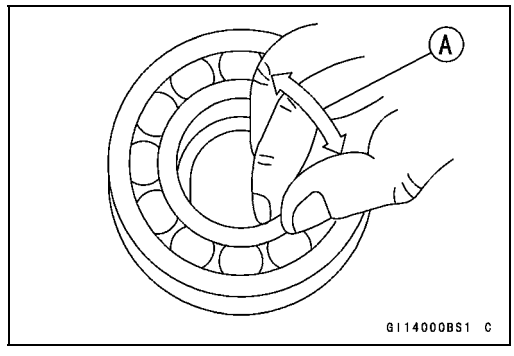
○Spin [A] the bearing by hand to check its condition.

★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.

● Check the needle bearings.

○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If there is any doubt as to the condition of a needle bearing, replace it.



Oil Seal Inspection

● Inspect the oil seals.

★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

Wheels/Tires

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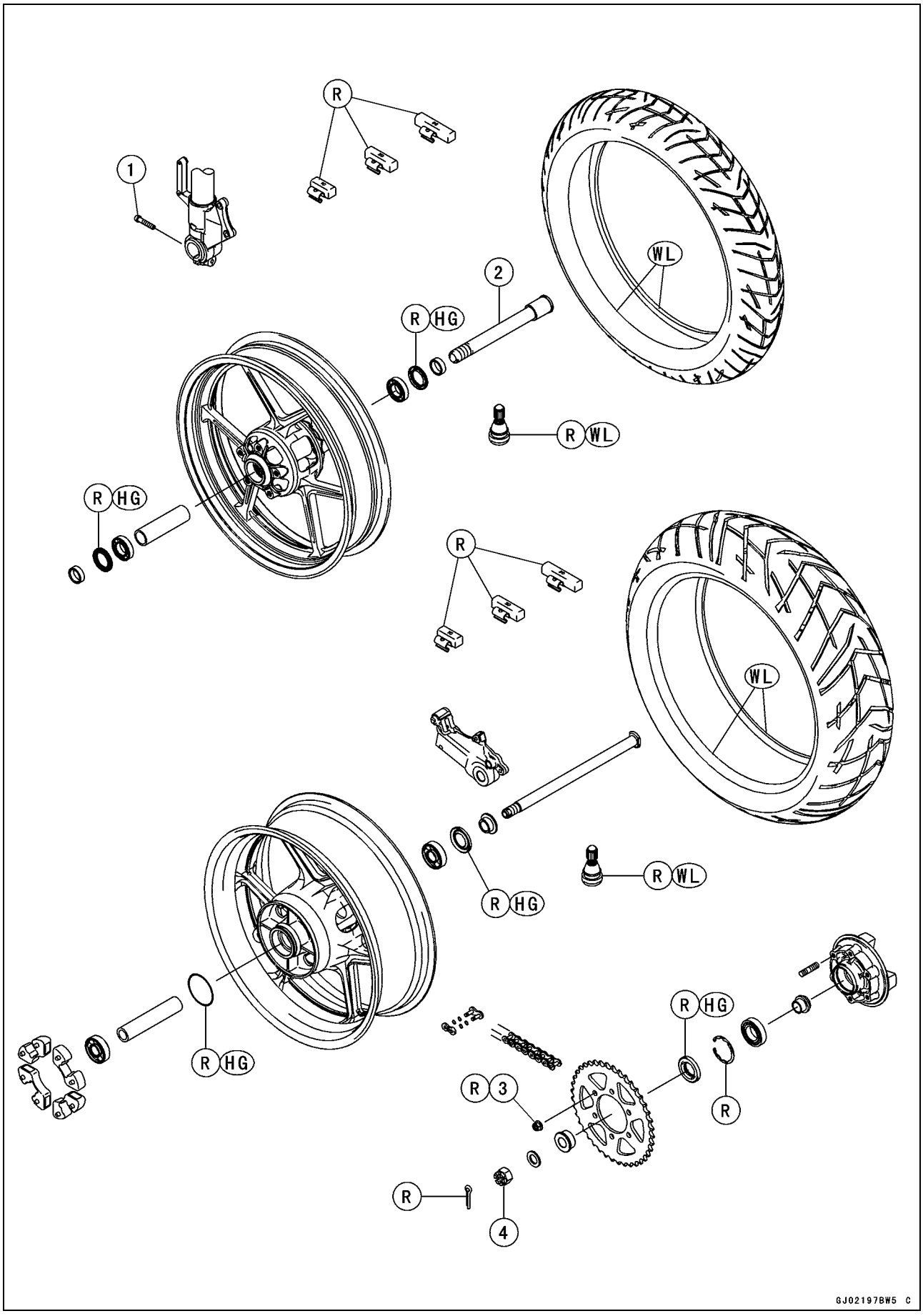
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Clamp Bolt	20	2.0	15	
2	Front Axle	127	13.0	93.7	
3	Rear Sprocket Nuts	59	6.0	44	R
4	Rear Axle Nut	108	11.0	79.7	

HG: Apply high-temperature grease.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

Specifications

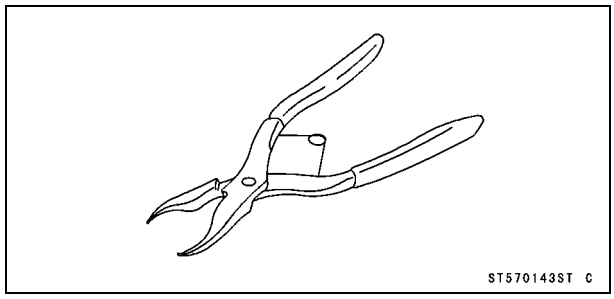
Item	Standard	Service Limit
Wheels (Rims)		
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 1.0 mm (0.04 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 1.0 mm (0.04 in.)
Axle Runout/100 mm (3.94 in.)	TIR 0.1 mm (0.004 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.35 oz.) or less	– – –
Balance Weights	10 g (0.35 oz.), 20 g (0.71 oz.), 30 g (1.06 oz.)	– – –
Rim Size:		
Front	J17M/C × MT3.50	– – –
Rear	J17M/C × MT5.50	– – –
Tires		
Air Pressure (when Cold):		
Front	Up to 220 kg (485 lb) load: 250 kPa (2.5 kgf/cm², 36 psi)	– – –
Rear	Up to 220 kg (485 lb) load: 290 kPa (2.9 kgf/cm², 42 psi)	– – –
Tread Depth:		
Front	4.4 mm (0.17 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	6.6 mm (0.26 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Standard Tires:	Make, Type	Size
Front	PIRELLI, SCORPION TRAIL	120/70 ZR17 M/C (58 W)
Rear	PIRELLI, SCORPION TRAIL K	180/55 ZR17 M/C (73 W)

⚠ WARNING

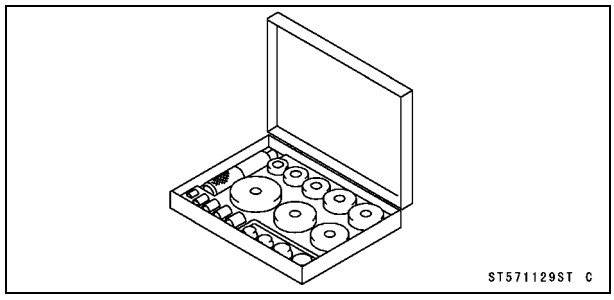
Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

Special Tools

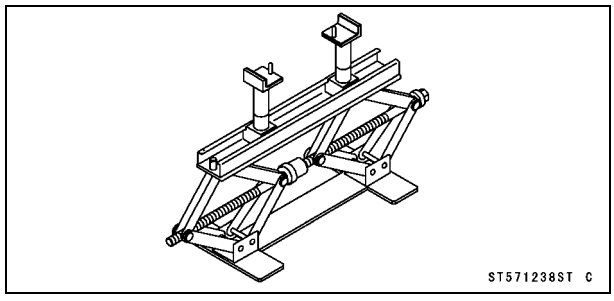
Inside Circlip Pliers:
57001-143



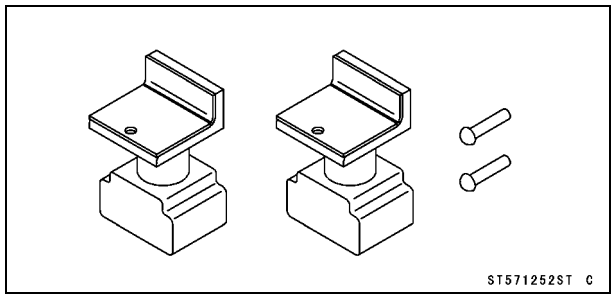
Bearing Driver Set:
57001-1129



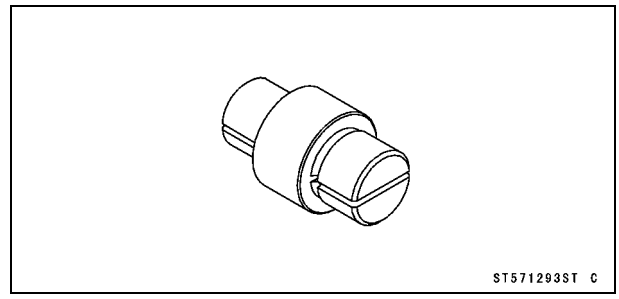
Jack:
57001-1238



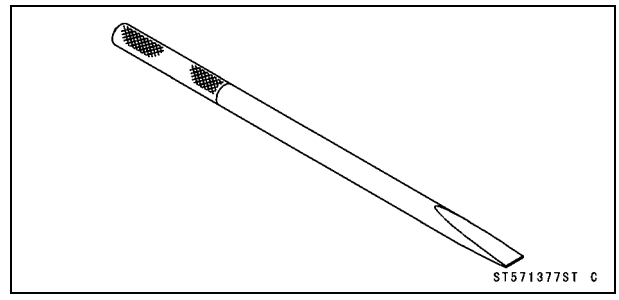
Attachment Jack:
57001-1252



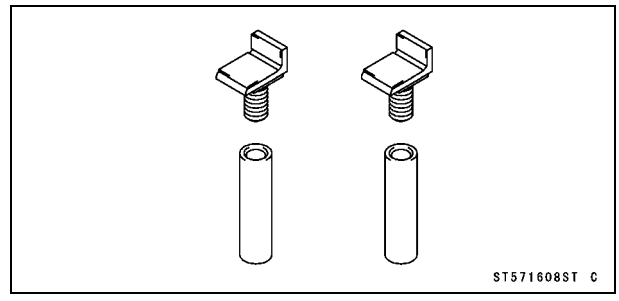
Bearing Remover Head, ϕ20 × ϕ22:
57001-1293



Bearing Remover Shaft, ϕ13:
57001-1377

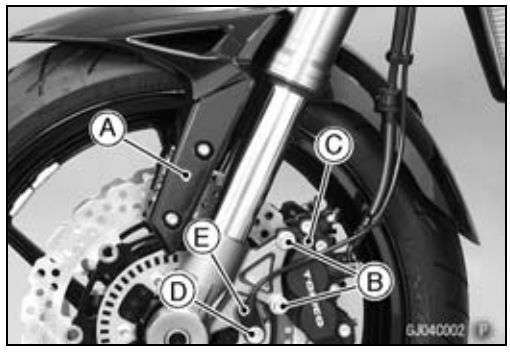


Jack Attachment:
57001-1608

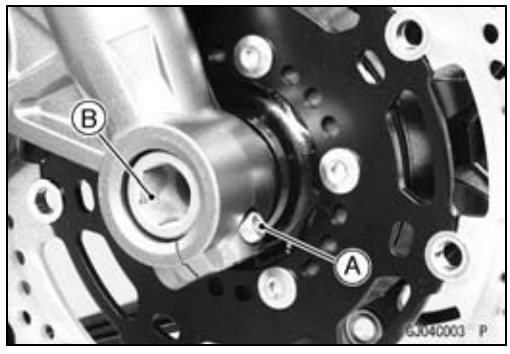


Wheels (Rims)

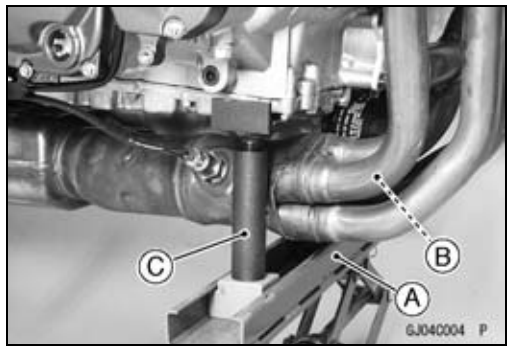
Front Wheel Removal



- Remove:
  Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Front Fender [A] (see Front Fender Removal in the Frame chapter)
  Front Caliper Mounting Bolts [B] (Both Sides)
  Front Calipers [C] (Both Sides)
  Bolt [D]
  Front Wheel Rotation Sensor [E]



- Loosen:
  Front Axle Clamp Bolt [A]
  Front Axle [B]



- Raise the front wheel off the ground.

  Special Tools - Jack [A]: 57001-1238
  Attachment Jack [B]: 57001-1252
  Jack Attachment [C]: 57001-1608

- Pull out the axle to the right and drop the front wheel out of the forks.

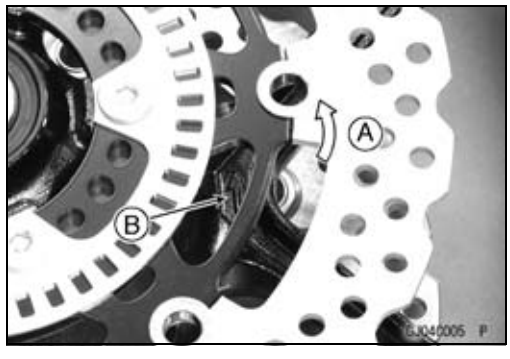
NOTICE

Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

Front Wheel Installation

NOTE

○*The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel spoke.*



- Check the wheel rotation mark on the front wheel and install it.

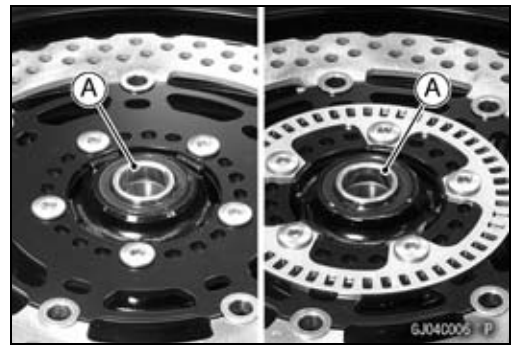
Wheels (Rims)

- Apply high-temperature grease to the grease seal lips.
- Fit the collars [A] on the both sides of the hub.

○The collars are identical.

- Insert the front axle.
- Tighten:

Torque - Front Axle: 127 N·m (13.0 kgf·m, 93.7 ft·lb)



- Before tightening the axle clamp bolt [A] on the right front fork leg, pump the front fork up and down 4 or 5 times to allow the right front fork leg to seat on the front axle.

NOTE

○*Put a block in front of the front wheel to stop moving.*

- Tighten:

Torque - Front Axle Clamp Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)

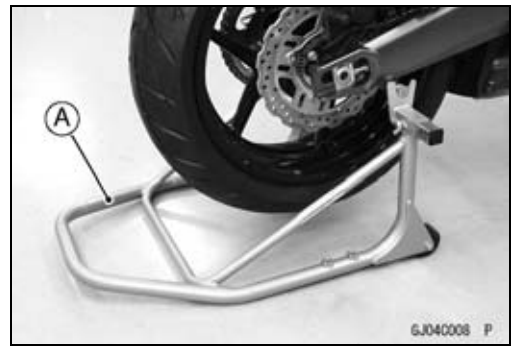
- Install the removed parts (see appropriate chapters).
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

⚠ WARNING

After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.

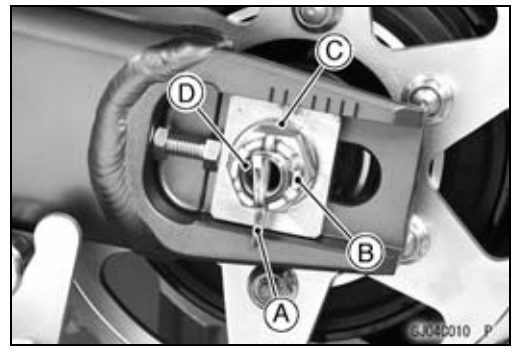
Rear Wheel Removal

- Remove the muffler body (see Muffler Body Removal in the Engine Top End chapter).
- Raise the rear wheel off the ground with the stand [A].



- Remove:

Chain Cover (see Drive Chain Removal in the Final Drive chapter)
Rear Wheel Rotation Sensor (see Rear Wheel Rotation Sensor Removal in the Brakes chapter)
Cotter Pin [A]
Rear Axle Nut [B]
Washer [C]
Axle [D] (from Right Side)



Wheels (Rims)

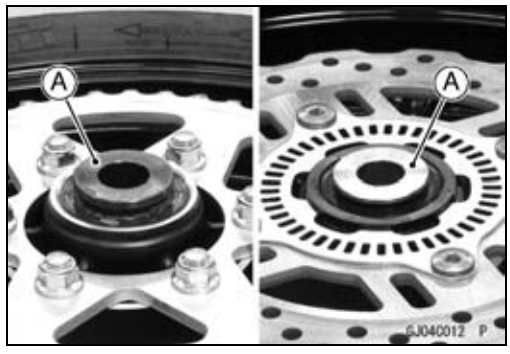
- Remove the drive chain [A] from the rear sprocket toward the left.
- Move the rear wheel back and remove it.

NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

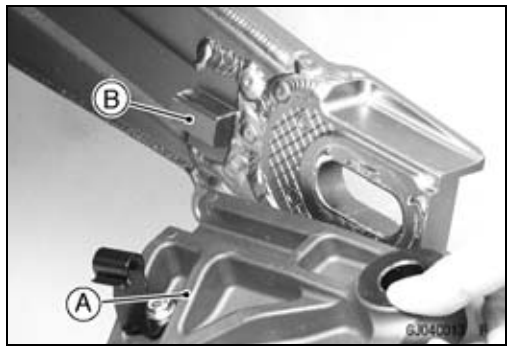
Rear Wheel Installation

- Apply high-temperature grease to the grease seal lips.
- Fit the collars on the both sides of the hub.
  Left Side Collar [A] (ϕ40 × ϕ35)
  Right Side Collar [B] (ϕ41 × ϕ28)



- Engage the drive chain with the rear sprocket.
- Install the caliper bracket [A] onto the stopper [B] of the swingarm.
- Insert the axle from the right side of the wheel.
- Adjust the drive chain slack before tightening the axle nut (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
- Tighten:

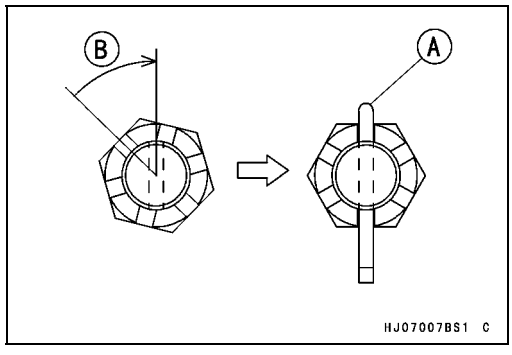
Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)



- Insert a new cotter pin [A].

NOTE

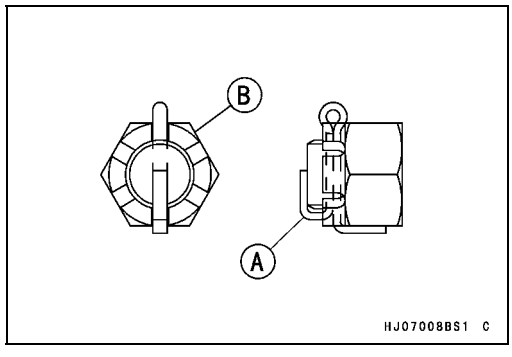
○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30 degrees.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*



- Bend the cotter pin [A] over the nut [B].

⚠ WARNING

A loose axle nut can lead to an accident resulting in serious injury or death. Tighten the axle nut to the proper torque and install a new cotter pin.



Wheels (Rims)

- Install rear wheel rotation sensor (see Rear Wheel Rotation Sensor Installation in the Brakes chapter).
- Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

⚠ WARNING

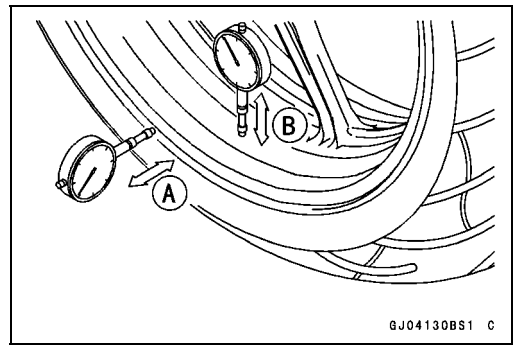
After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.

Wheel Inspection

- Raise the front/rear wheel off the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608
Attachment Jack: 57001-1252

- Spin the wheel lightly, and check for roughness or binding.
★If roughness or binding is found, replace the hub bearings (see Hub Bearing Removal/Installation).
- Inspect the wheel for small cracks, dents, bending, or warp.
★If there is any damage to the wheel, replace the wheel.
- Remove the wheel, and support it with the tire by the axle.
- Measure the rim runout, axial [A] and radial [B], with a dial gauge.
★If rim runout exceeds the service limit, check the hub bearings (see Hub Bearing Inspection).
★If the problem is not due to the bearings, replace the wheel.



Rim Runout (with tire installed)

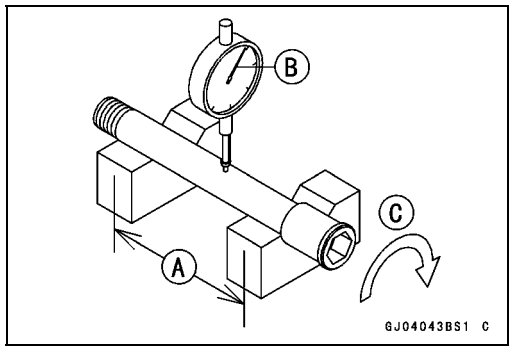
Standard:	
Axial	**TIR 0.5 mm (0.02 in.) or less**
Radial	**TIR 0.8 mm (0.03 in.) or less**
Service Limit:	
Axial	**TIR 1.0 mm (0.04 in.)**
Radial	**TIR 1.0 mm (0.04 in.)**

⚠ WARNING

Damaged wheel parts may fail and cause an accident resulting in serious injury or death. Never attempt to repair a damaged wheel part. If the wheel part is damaged, it must be replaced with a new one.

Wheels (Rims)

Axle Inspection



- Remove the front and rear axles (see Front/Rear Wheel Removal).
- Visually inspect the front and rear axle for damages.

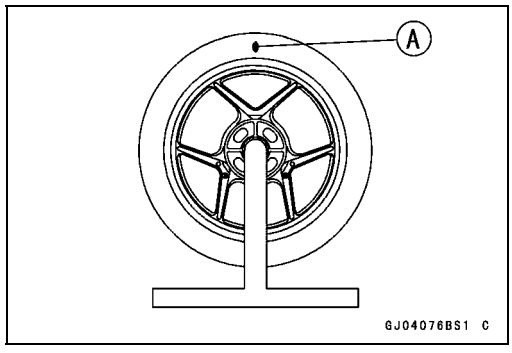
★If the axle is damaged or bent, replace it.

- Place the axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the axle at a point halfway between the blocks. Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.

★If axle runout exceeds the service limit, replace the axle.

Axle Runout/100 mm (3.94 in.)
Standard: TIR 0.1 mm (0.004 in.) or less
Service Limit: TIR 0.2 mm (0.008 in.)

Balance Inspection

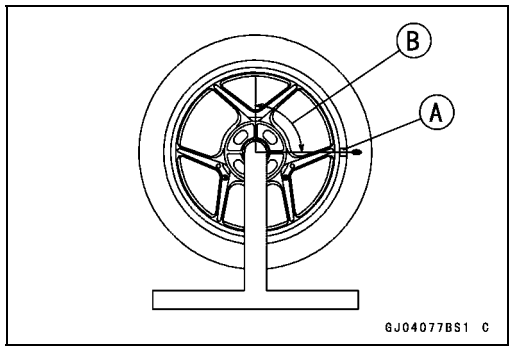


- Remove the front and rear wheels (see Front/Rear Wheel Removal).
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.

○Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.

★If the wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).

Balance Adjustment

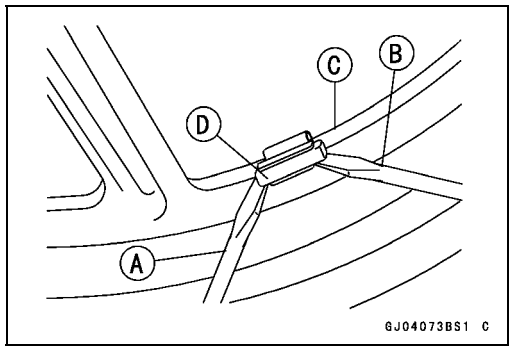


- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.

★If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.

- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.

Balance Weight Removal



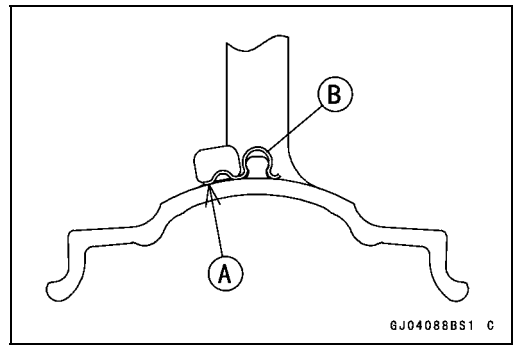
- Insert a standard tip screwdrivers [A] [B] between the rib [C] and weight [D] as shown in the figure.
- Pry the balance weight with two standard tip screwdrivers and remove the balance weight.
- Discard the used balance weight.

NOTICE

Do not tap the screwdrivers. The rim could be damaged.

Wheels (Rims)

Balance Weight Installation



● Check if the weight portion has any play on the blade [A] and clip [B].

★If it does, discard it.

⚠ WARNING

Unbalanced wheels can create an unsafe riding condition. If the balance weight has any play on the rib of the rim, the blade and/or clip have been stretched. Replace the loose balance weight. Do not reuse used balance weight.

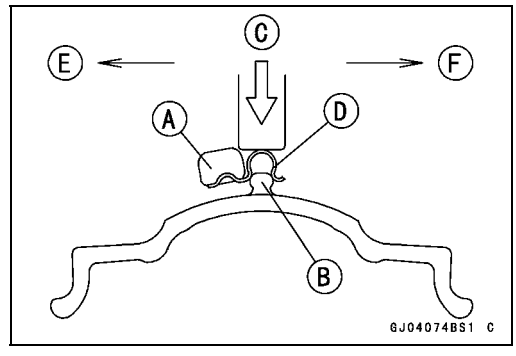
Balance Weight

Part Number	Weight
41075-0007	10 g (0.35 oz.)
41075-0008	20 g (0.71 oz.)
41075-0009	30 g (1.06 oz.)

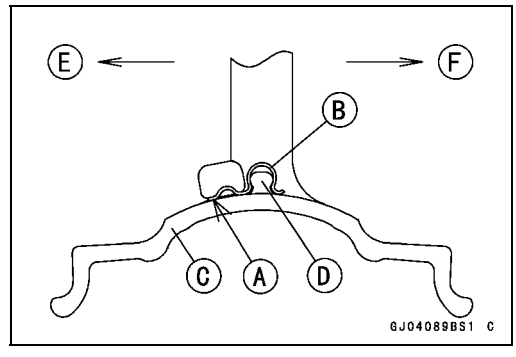
NOTE

○*Balance weights are available from Kawasaki dealers in 10, 20 and 30 grams (0.35, 0.71 and 1.06 oz.) sizes. An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.*

○*Do not use four or more balance weight (more than 90 gram, 3.2 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.*



● Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].
Left Side [E]
Right Side [F]



● Be sure to install the balance weight.

○Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].
Left Side [E]
Right Side [F]

Tires

Air Pressure Inspection/Adjustment

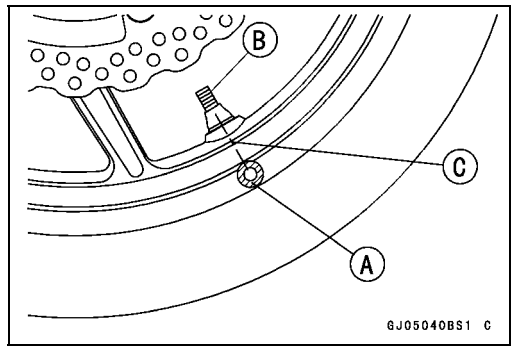
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

Tire Inspection

- Refer to the Wheel/Tire Damage Inspection in the Periodic Maintenance chapter.

Tire Removal

- Remove:
  Wheels (see Front/Rear Wheel Removal)
  Valve Core (Let out the air)
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
  Chalk Mark or Yellow Mark [A]
  Air Valve [B]
  Align [C]



- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

NOTICE

Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.

- Remove the tire from the rim using a suitable commercially available tire changer.

NOTE

○*The tires cannot be removed with hand tools because they fit the rims too tightly.*

Tire Installation

⚠ WARNING

Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

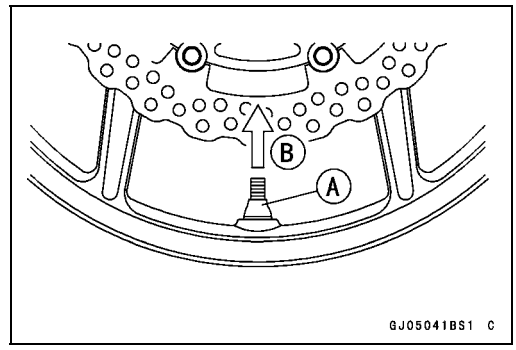
NOTICE

Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

Tires

● Install a new valve in the rim.

○Remove the valve cap, lubricate the stem seal [A] with a soap and water solution or rubber lubricant, and pull [B] the valve stem through the rim from the inside out until it snaps into place.

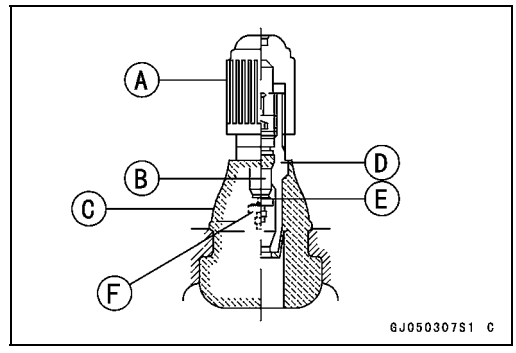


NOTICE

Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.

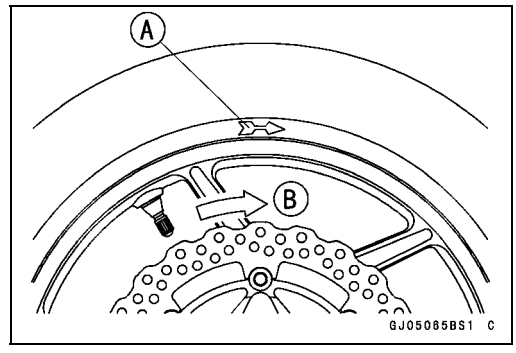
○The air valve is shown in the figure.

Valve Cap [A]
Valve Core [B]
Stem Seal [C]
Valve Stem [D]
Valve Seat [E]
Valve Opened [F]



● Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

Tire Rotation Mark [A]
Rotating Direction [B]

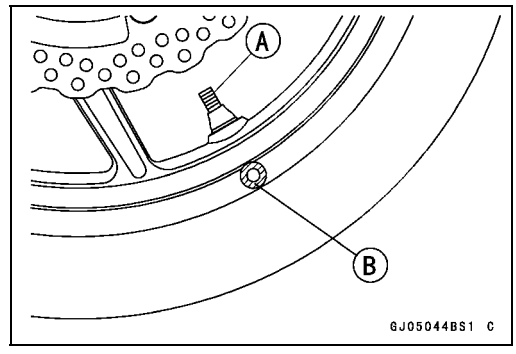


● Position the tire on the rim so that the valve [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).

● Install the tire bead over the rim flange using a suitable commercially available tire changer.

● Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.

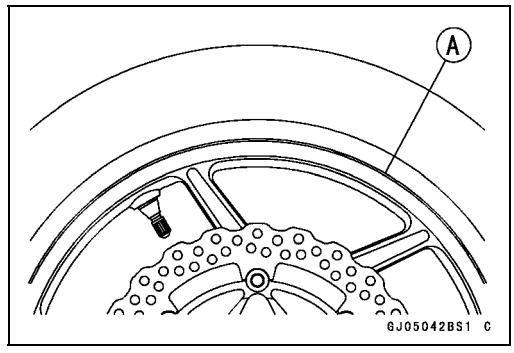
● Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.



⚠ WARNING

Overinflating a tire can cause it to explode, causing serious injury or death. Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/cm², 57 psi).

Tires



- Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.

★If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.

- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leakage.

○Inflate the tire slightly above standard inflation.

○Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.

- Adjust the air pressure to the specified pressure (see Air Pressure Inspection in the Periodic Maintenance chapter).
- Install the air valve cap.
- Adjust the wheel balance (see Balance Adjustment).

Tire Repair

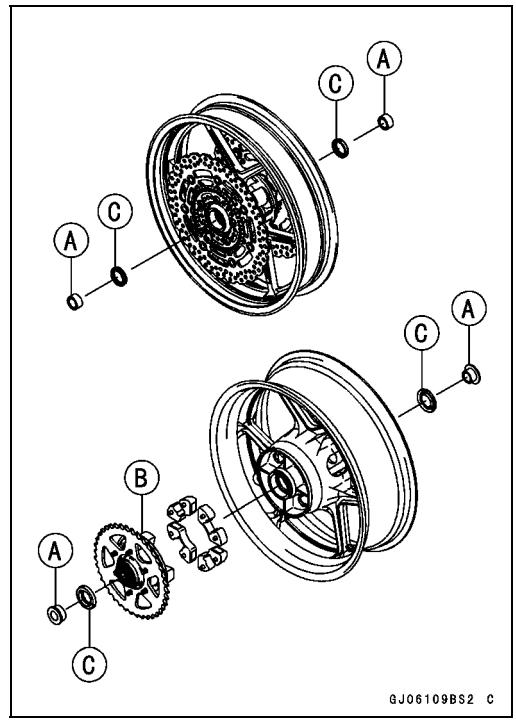
Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

Hub Bearing

Hub Bearing Removal

- Remove the wheels (see Front/Rear Wheel Removal), and take out the following.
  Collars [A]
  Coupling [B] (Out of rear hub)
  Grease Seals [C]

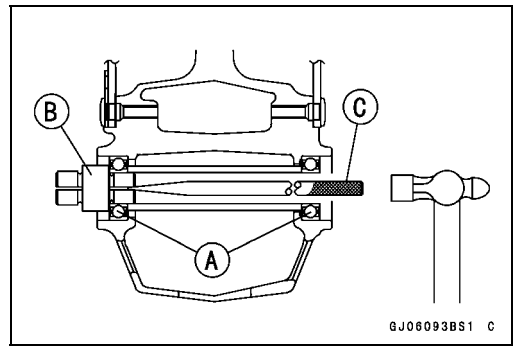
Special Tool - Inside Circlip Pliers: 57001-143



- Use the bearing remover to remove the hub bearings [A].

NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.



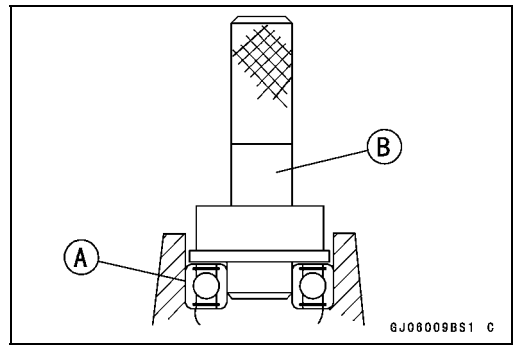
Special Tools - Bearing Remover Head, ϕ20 × ϕ22 [B]: 57001-1293
Bearing Remover Shaft, ϕ13 [C]: 57001-1377

Hub Bearing Installation

- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.
- Install the bearings by using the bearing driver set which does not contact the bearing inner race.

NOTE

○*Install the bearings so that the marked side faces out.*



- Press in each right the bearing [A] until they are bottomed.

Special Tool - Bearing Driver Set [B]: 57001-1129

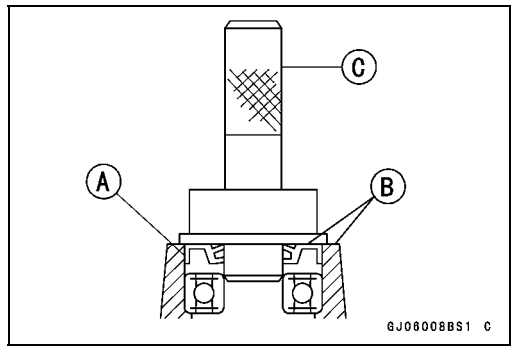
Hub Bearing

● Replace the circlip with a new one.

Special Tool - Inside Circlip Pliers: 57001-143

● Replace the grease seals with new ones.
● Press in the grease seals [A] so that the seal surface flush [B] with the end of the hole.
○Apply high-temperature grease to the grease seal lips.

Special Tool - Bearing Driver Set [C]: 57001-1129

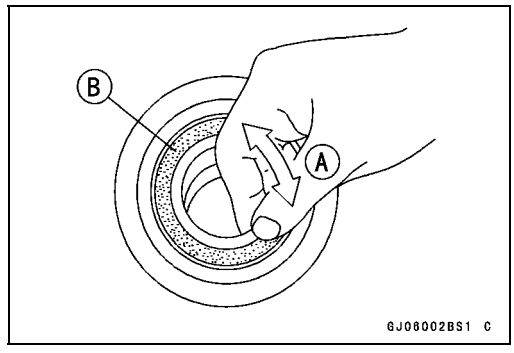


Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

NOTE

○*Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.*



● Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
★If bearing play, roughness, or binding is found, replace the bearing.
● Examine the bearing seal [B] for tears or leakage.
★If the seal is torn or is leaking, replace the bearing.

Hub Bearing Lubrication

NOTE

○*Since the hub bearings are packed with grease and sealed, lubrication is not required.*

Final Drive

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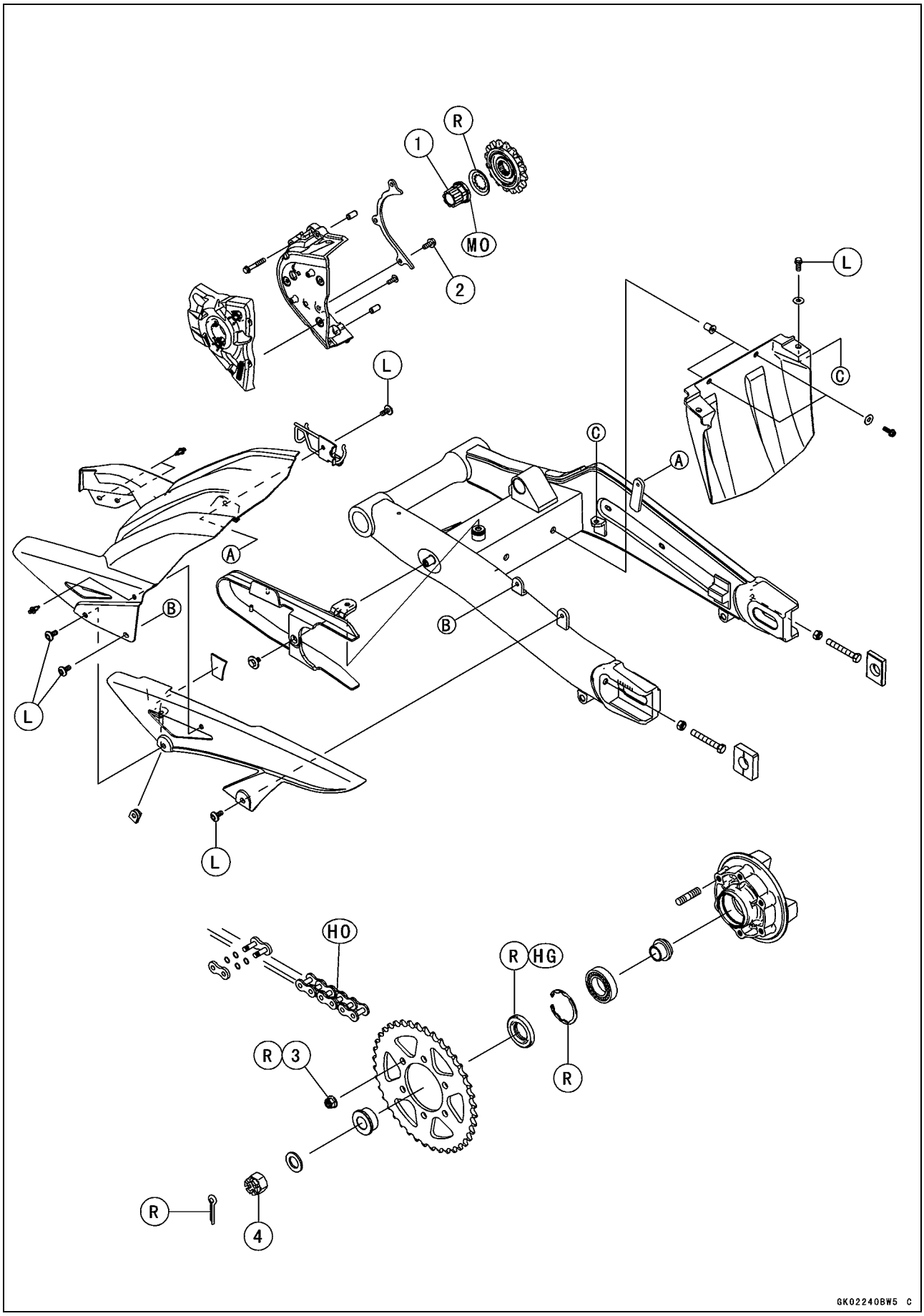
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Sprocket Nut	125	12.7	92.2	MO
2	Drive Chain Guide Bolts	9.8	1.0	87 in·lb	
3	Rear Sprocket Nuts	59	6.0	44	R
4	Rear Axle Nut	108	11.0	79.7	

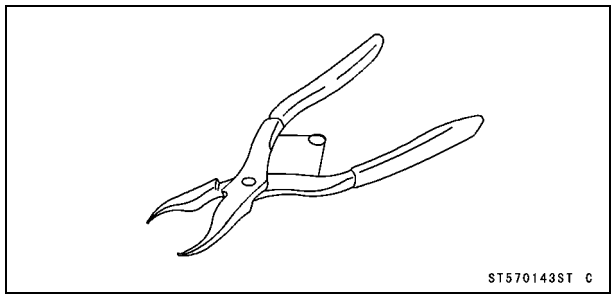
HG: Apply high-temperature grease.
HO: Apply heavy oil.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts

Specifications

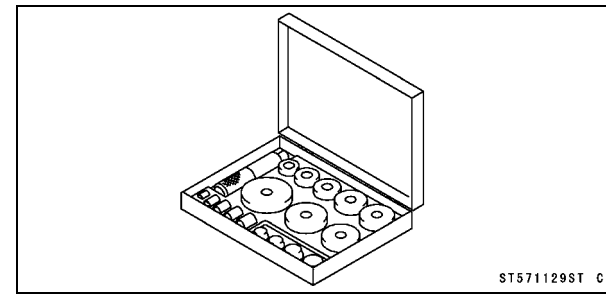
Item	Standard	Service Limit
Drive Chain		
Drive Chain Slack	25 ~ 35 mm (1.0 ~ 1.4 in.)	– – –
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	319 mm (12.6 in.)
Standard Chain:		
Make	ENUMA	– – –
Type	EK525RMX	– – –
Link	116 links	– – –
Link Pin Outside Diameter (When drive chain replacing)	5.6 ~ 6.0 mm (0.22 ~ 0.24 in.)	– – –
Link Plates Outside width (When drive chain replacing)	19.35 ~ 19.55 mm (0.7618 ~ 0.7697 in.)	– – –
Sprockets		
Rear Sprocket Warp	0.4 mm (0.016 in.) or less	0.5 mm (0.020 in.)

Special Tools

Inside Circlip Pliers:
57001-143



Bearing Driver Set:
57001-1129



Drive Chain

Drive Chain Slack Inspection

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

Drive Chain Slack Adjustment

- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

Wheel Alignment Inspection/Adjustment

- Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

Drive Chain Wear Inspection

- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

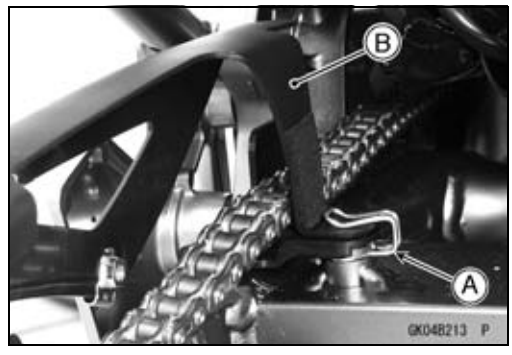
Drive Chain Lubrication

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

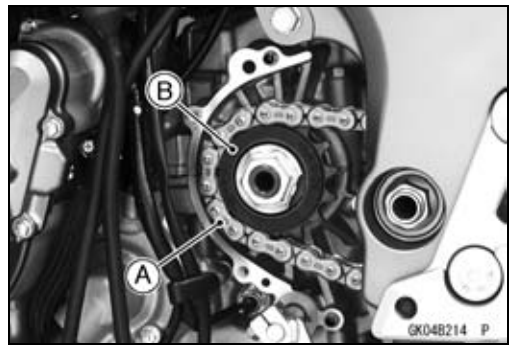
Drive Chain Removal

- Remove:
  Upper Mud Guard (see Upper Mud Guard Removal in the Frame chapter)
  Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  Chain Cover Bolt [A]

- Remove:
  Clamp [A]
  Chain Cover [B]
  Swingarm (see Swingarm Removal in the Suspension chapter)

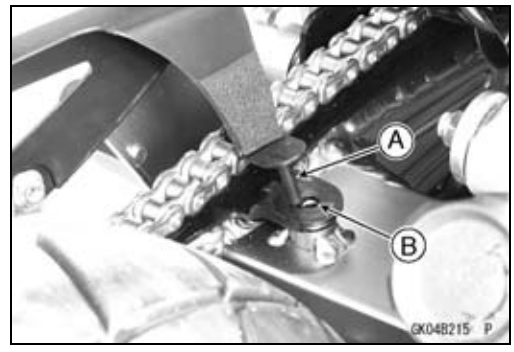


- Remove:
  Engine Sprocket Cover (see Engine Sprocket Cover)
- Remove the drive chain [A] from the engine sprocket [B], and take it off the chassis.



Drive Chain

Drive Chain Installation



- Install the drive chain to the engine sprocket.
- Install:
  Swingarm (see Swingarm Installation in the Suspension chapter)
  Rear Wheel (see Rear Wheel Installation in the Wheels/Tires chapter)
  Engine Sprocket Cover (see Engine Sprocket Cover Installation)
- Insert the projection [A] on the chain cover into the swingarm hole [B].
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

Drive Chain Replacement

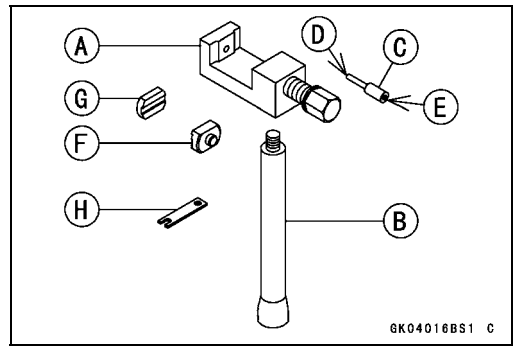
- Remove:
  Chain Cover (see Drive Chain Removal)
  Engine Sprocket Cover (see Engine Sprocket Removal)

NOTICE

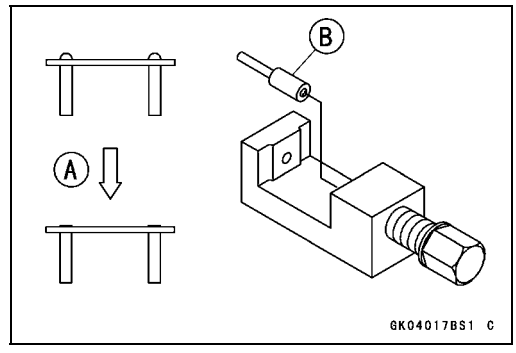
For safety, if the drive chain shall be replaced, replace it using a recommended tool.

Recommended Tool - Type: EK Joint Tool #50
Brand: ENUMA

Body [A]
Handlebar [B]
Cutting and Riveting Pin [C]
For Cutting [D]
For Riveting [E]
Plate Holder (A) [F]
Plate Holder (B) [G]
Gauge [H]

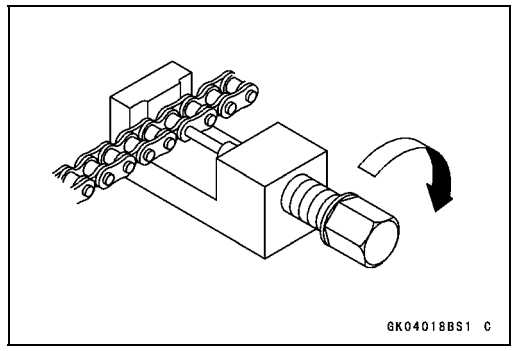


- Grind [A] the pin head to make it flat.
- Set the cutting and riveting pin [B] as shown in the figure.

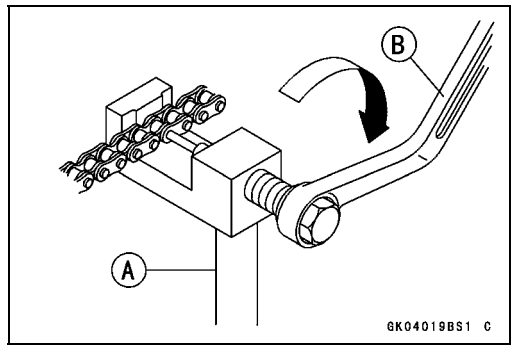


Drive Chain

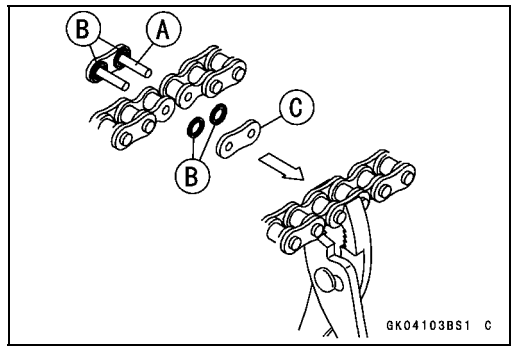
- Screw the pin holder until it touches chain pin.
- Be sure that the cutting pin hits center of chain pin.



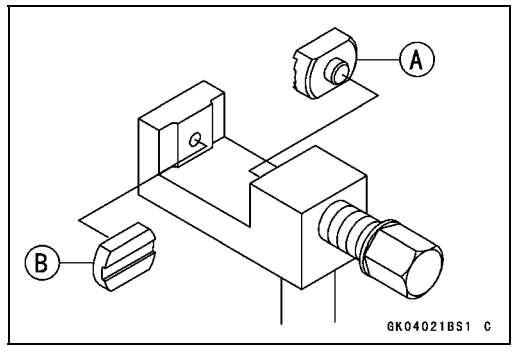
- Screw the handlebar [A] into body.
- Turn the pin holder with wrench [B] clockwise to extract chain pin.



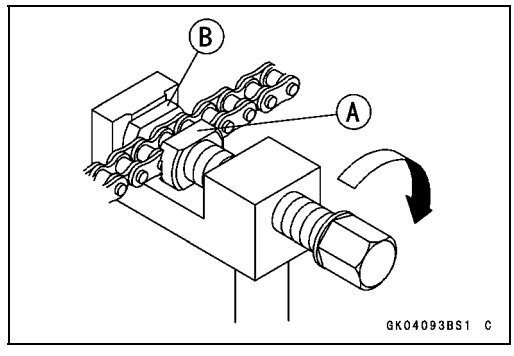
- Replace the link pin, link plate and grease seals.
- Apply grease to the link pins [A] and grease seals [B].
- Engage the drive chain on the engine and rear sprockets.
- Insert the link pins in the drive chain ends.
- Install the grease seals.
- Install the link plate [C] so that the mark faces out.
- Push the link plate by hand or plier to fix it.
- In case of grease seals chain, be sure to set the grease seals correctly.



- Set the plate holder (A) [A] and plate holder (B) [B] on the body.

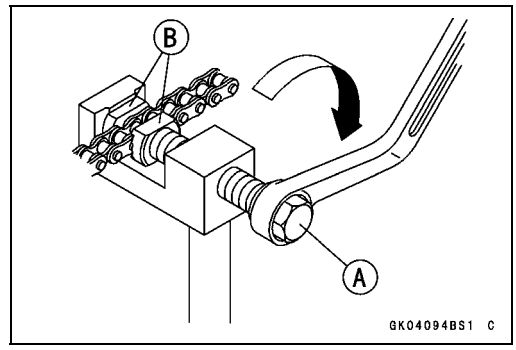


- Fit the plate holder (A) [A] to link plate.
- Turn the pin holder by hand until plate holder (B) [B] touches the other link plate.

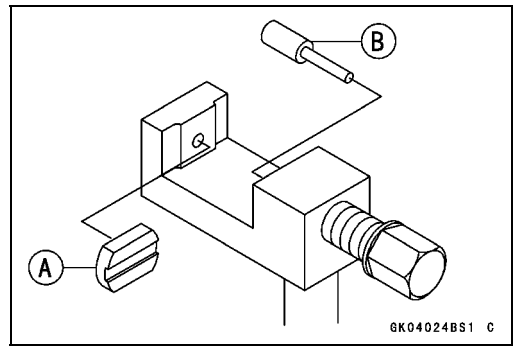


Drive Chain

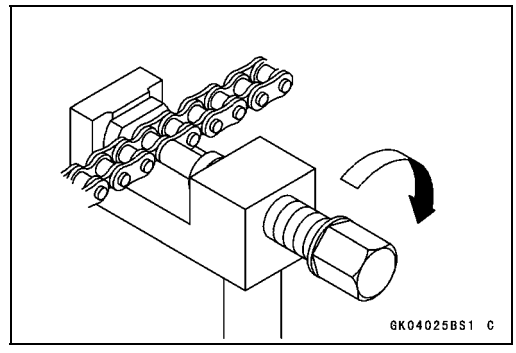
- Turn the pin holder [A] by wrench clockwise until two pins of link come into groove of plate holders [B].
- Take off the plate holder.



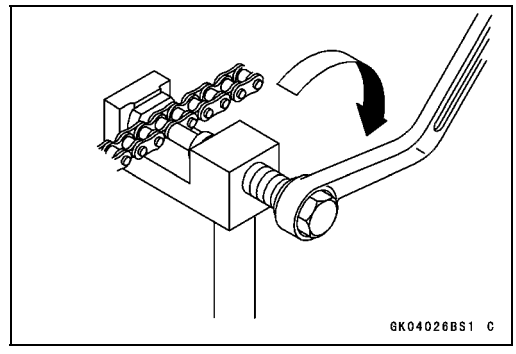
- Set the plate holder (B) [A] and cutting and riveting pin [B] as shown in the figure.



- Turn the pin holder until riveting pin touches link pin.



- Turn the wrench clockwise until tip of riveting pin hits to the link pin.
- Rivet it.
- Same work for the other link pin.

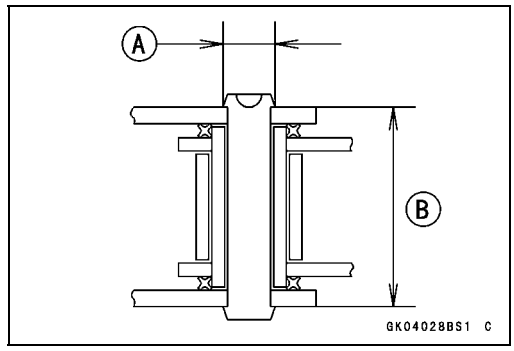


Drive Chain

- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates width [B].

Link Pin Outside Diameter
Standard: 5.6 ~ 6.0 mm (0.22 ~ 0.24 in.)

Link Plates Outside Width
Standard: 19.35 ~ 19.55 mm (0.7618 ~ 0.7697 in.)



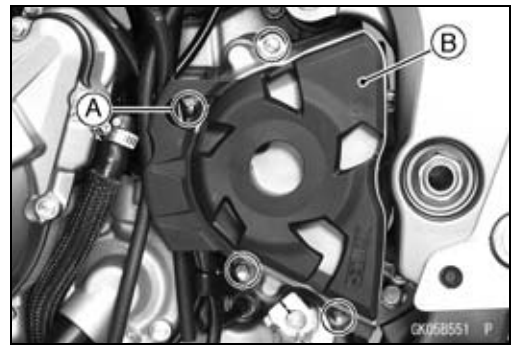
★If the reading exceeds the specified length, cut and rejoin the chain again.

- Check:
  Movement of the Rollers
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

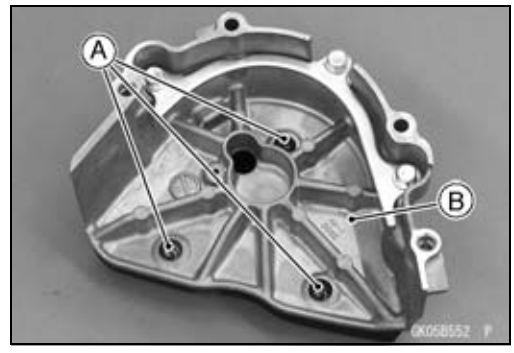
Sprocket, Coupling

Engine Sprocket Cover Removal

- Remove:
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Engine Sprocket Inner Cover Bolts [A]
  Engine Sprocket Inner and Outer Cover [B]



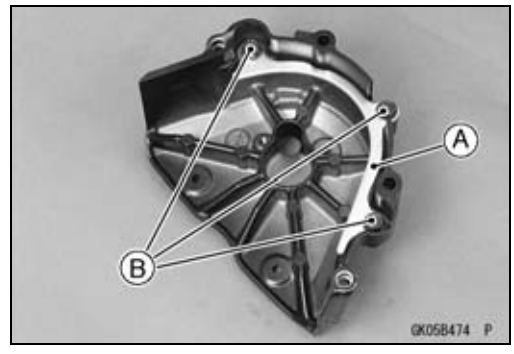
- Remove the engine sprocket outer cover screws [A] to separate the outer and inner cover [B].



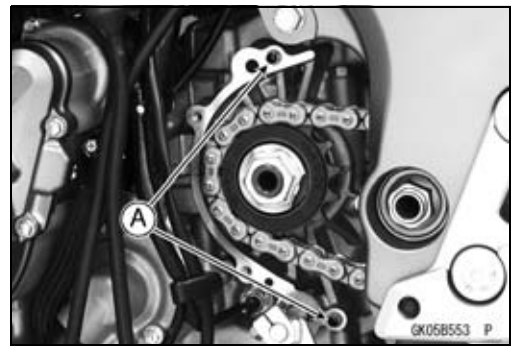
Engine Sproket Cover Installation

- Be sure to install the drive chain guide [A].
- Tighten:

Torque - Drive Chain Guide Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)



- Install the engine sprocket outer cover to the inner cover.
- Be sure to install the dowel pins [A].
- Install the engine sprocket inner cover.

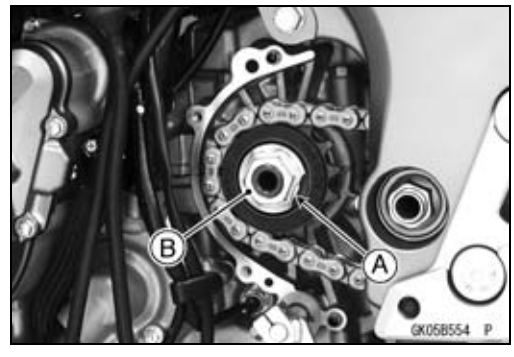


Engine Sprocket Removal

- Remove:
  Engine Sprocket Cover (see Engine Sprocket Cover Removal)
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

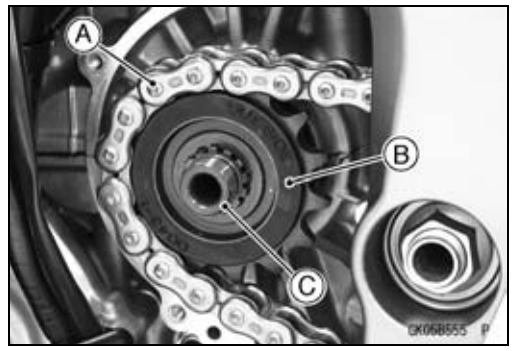
NOTE

○*When loosening the engine sprocket nut, hold the rear brake on.*



Sprocket, Coupling

- Raise the rear wheel off the ground with the stand.
- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Remove the drive chain from the rear sprocket toward the right.
- Disengage the drive chain [A] from the engine sprocket [B].
- Pull the engine sprocket off the output shaft [C].



Engine Sprocket Installation

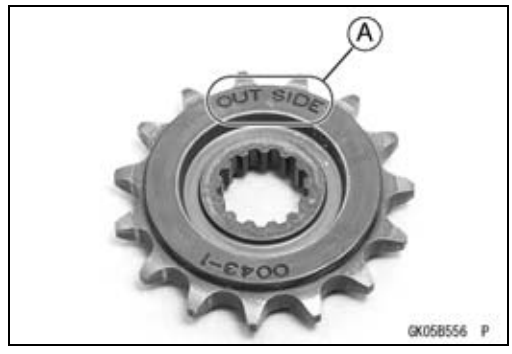
- Replace the sprocket washer.
- Install the engine sprocket so that “OUT SIDE” letters [A] face outward.
- Apply molybdenum disulfide oil solution to the threads and the seating surface of the engine sprocket nut.
- Tighten:

Torque - Engine Sprocket Nut: 125 N·m (12.7 kgf·m, 92.2 ft·lb)

NOTE

○*Tighten the nut while applying the rear brake.*

- After torquing the engine sprocket nut, bend the one side of the washer over the nut.
- Adjust the drive chain slack after installing the engine sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



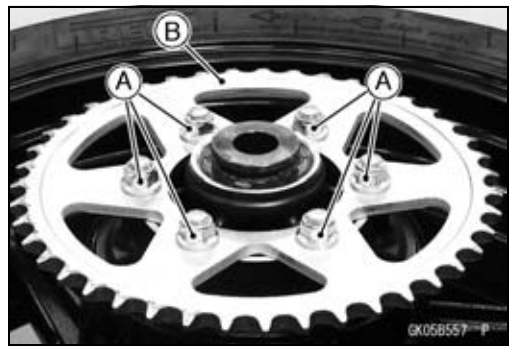
Rear Sprocket Removal

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

- Remove the rear sprocket nuts [A].
- Remove the rear sprocket [B].

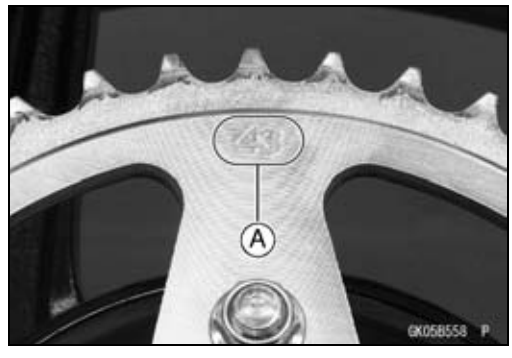


Rear Sprocket Installation

- Install the sprocket facing the tooth number marking [A] outward.
- Replace the rear sprocket nuts with new ones.
- Tighten:

Torque - Rear Sprocket Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

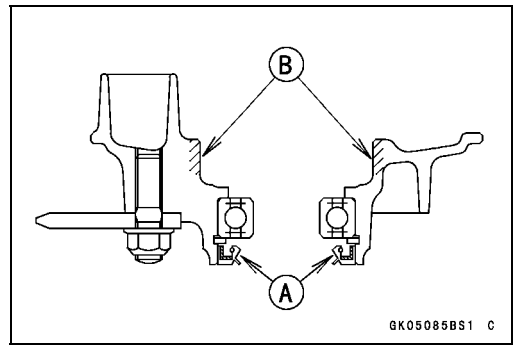
- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).



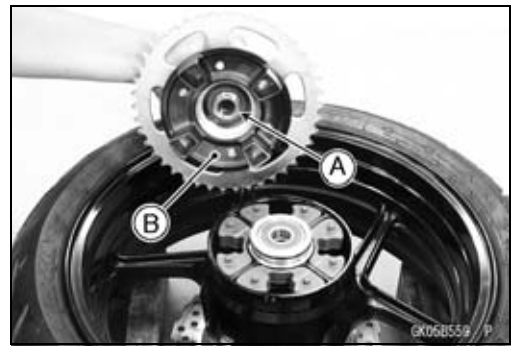
Sprocket, Coupling

Coupling Installation

- Apply high-temperature grease to the following parts.
  Coupling Grease Seal Lip [A]
  Coupling Internal Surface [B]



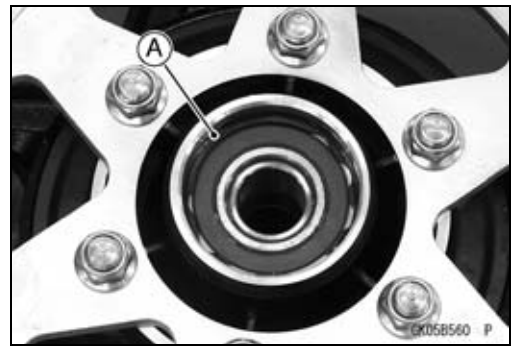
- Install:
  Collar [A]
  Coupling [B]



Coupling Bearing Removal

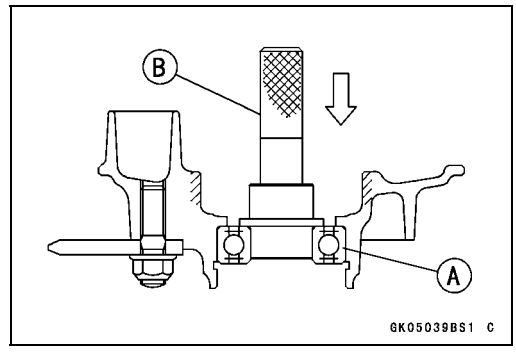
- Remove:
  Coupling
  Grease Seal
  Circlip [A]

  Special Tool - Inside Circlip Pliers: 57001-143



- Remove the bearing [A] by tapping from the wheel side.

  Special Tool - Bearing Driver Set [B]: 57001-1129



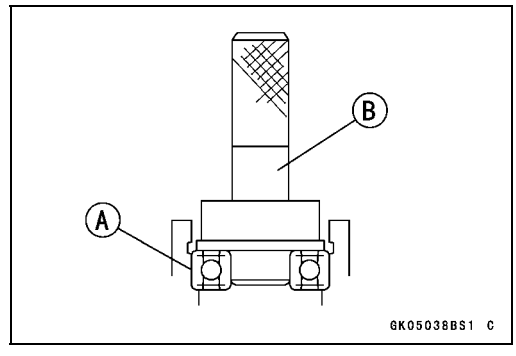
Coupling Bearing Installation

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.

  Special Tool - Bearing Driver Set [B]: 57001-1129

- Pack the bearing with high-temperature grease.
- Replace the circlip with a new one.

  Special Tool - Inside Circlip Pliers: 57001-143



Sprocket, Coupling

- Replace the grease seal with a new one.
- Press in the grease seal so that the seal surface is flush with the end of the hole.

○Apply high-temperature grease to the grease seal lip.

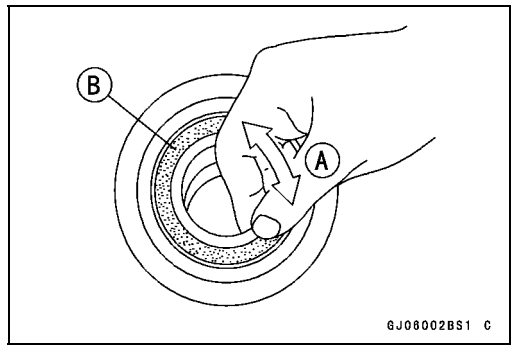
Special Tool - Bearing Driver Set: 57001-1129

Coupling Bearing Inspection

Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

NOTE

○*It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.*



- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness or binding.

★If the bearing play, roughness or binding is found, replace the bearing.

- Examine the bearing seal [B] for tears or leakage.

★If the seal is torn ot is leaking, replace the bearing.

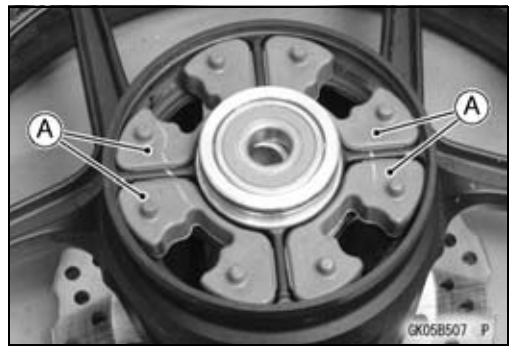
Coupling Bearing Lubrication

NOTE

○*Since the coupling bearing is packed with grease and sealed, lubrication is not required.*

Coupling Damper Inspection

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.

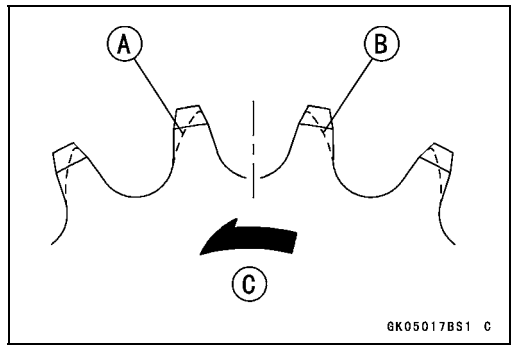


Sprocket Wear Inspection

- Visually inspect the engine and rear sprocket teeth for wear and damage.

★If the teeth are worn as illustrated, replace the sprocket, and inspect the drive chain wear (see Drive Chain Wear Inspection in the Periodic Maintenance chapter).

Worn Tooth (Engine Sprocket) [A]
Worn Tooth (Rear Sprocket) [B]
Direction of Rotation [C]

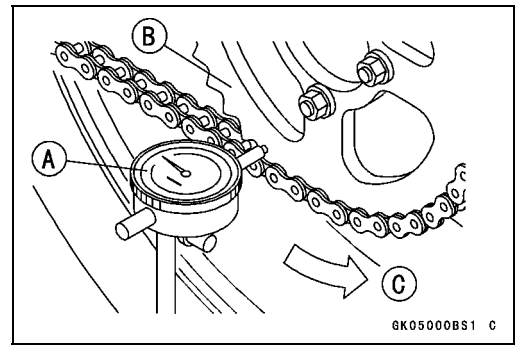


NOTE

○*If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.*

Sprocket, Coupling

Rear Sprocket Warp Inspection



- Raise the rear wheel off the ground with the stand so that it will turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown in the figure, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).

★If the runout exceeds the service limit, replace the rear sprocket.

Rear Sprocket Warp

Standard: 0.4 mm (0.016 in.) or less

Service Limit: 0.5 mm (0.020 in.)

Brakes

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Exploded View

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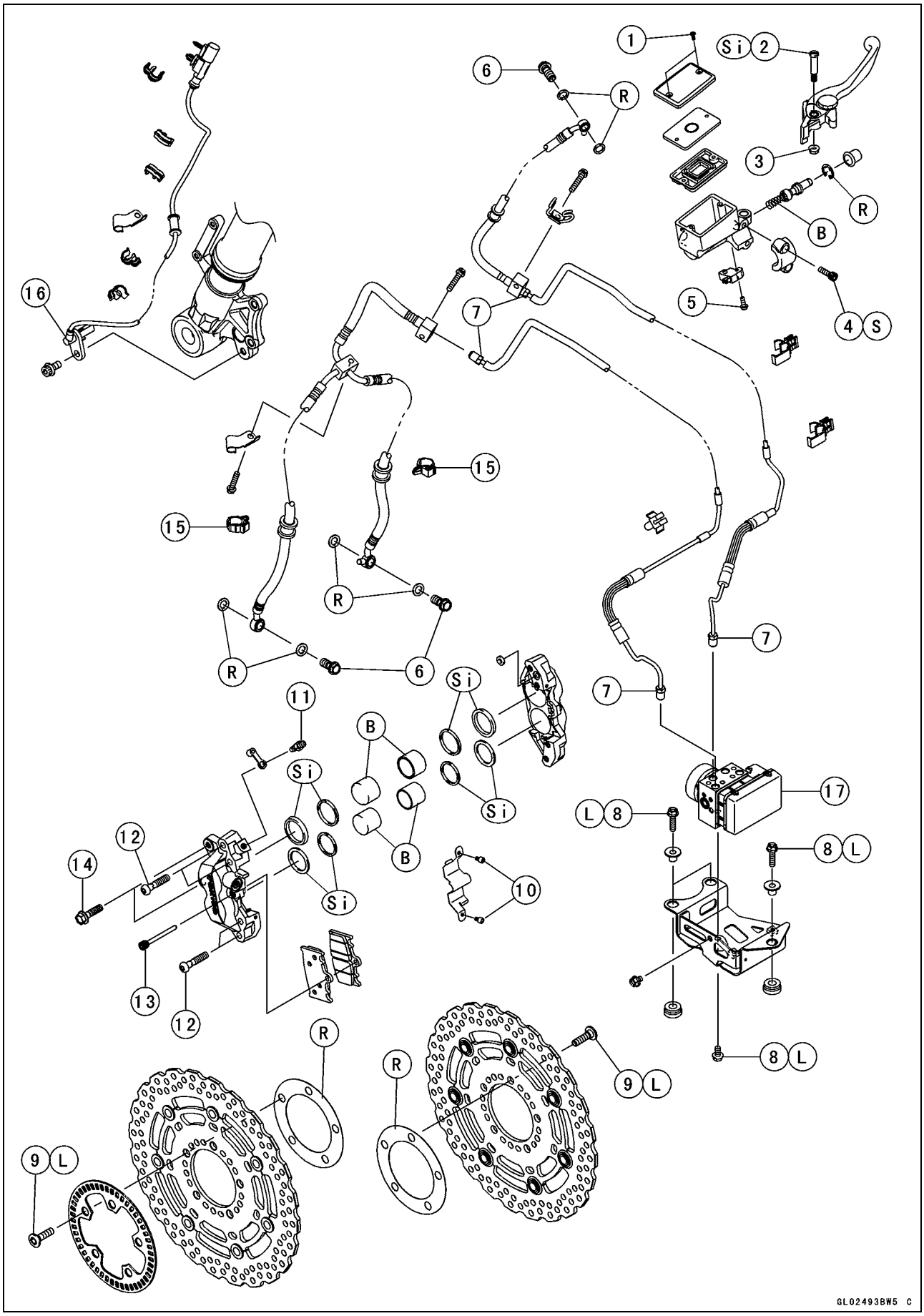
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Master Cylinder Reservoir Cap Screws	1.5	0.15	13 in·lb	
2	Brake Lever Pivot Bolt	1.0	0.10	8.9 in·lb	Si
3	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
4	Front Master Cylinder Clamp Bolts	11	1.1	97 in·lb	S
5	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
6	Brake Hose Banjo Bolts	25	2.5	18	
7	Brake Pipe Joint Nuts	18	1.8	13	
8	ABS Hydraulic Unit Bracket Bolts	8.8	0.90	78 in·lb	L
9	Front Brake Disc Mounting Bolts	27	2.8	20	L
10	Front Brake Pad Spring Bolts	2.9	0.30	26 in·lb	
11	Bleed Valve	7.8	0.80	69 in·lb	
12	Front Caliper Assembly Bolts	22	2.2	16	
13	Front Brake Pad Pin	15	1.5	11	
14	Front Caliper Mounting Bolts	25	2.5	18	

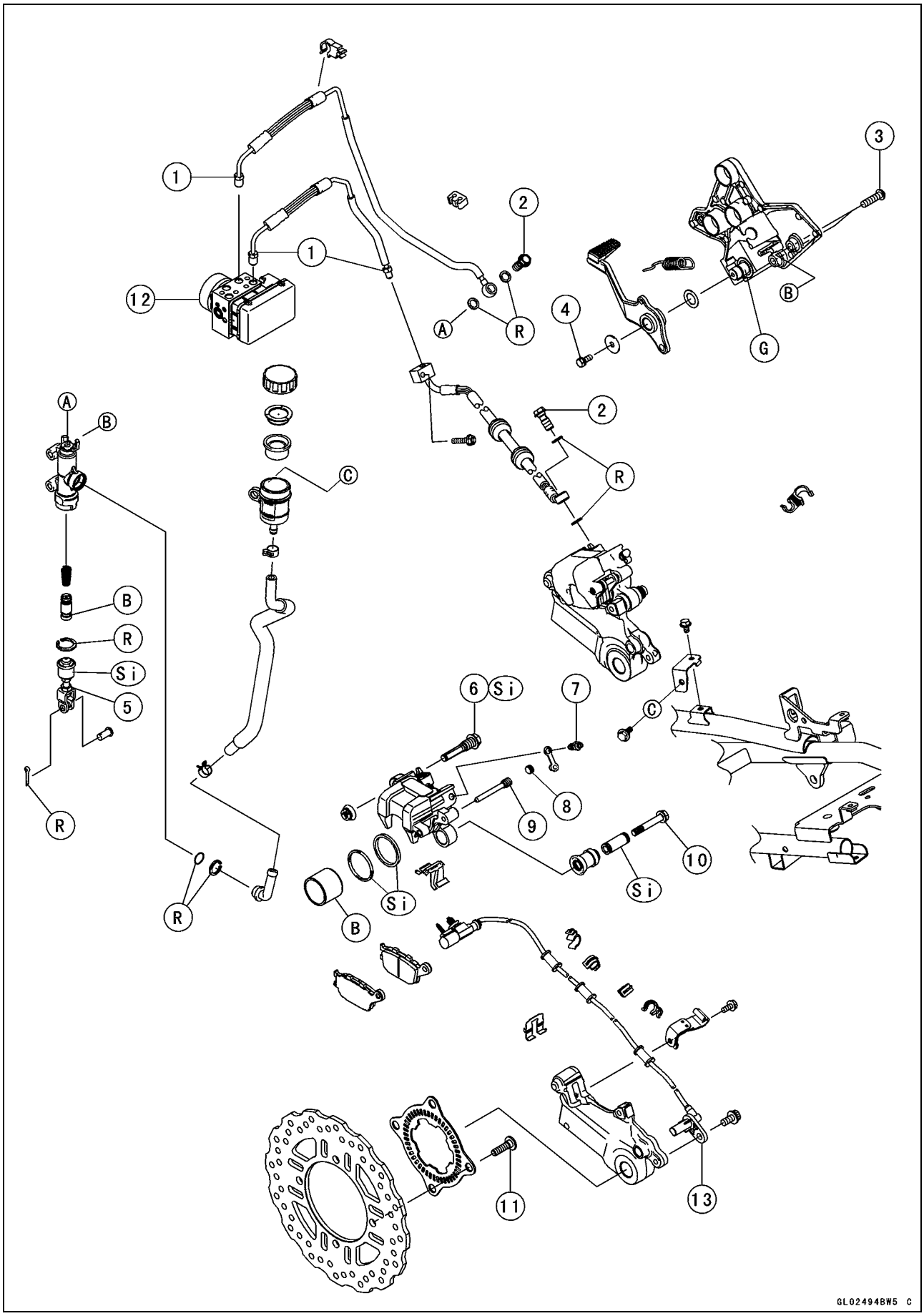
15. Face the lock portion of the clamp backward.
16. Front Wheel Rotation Sensor
17. ABS Hydraulic Unit

B: Apply brake fluid.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.
Si: Apply silicone grease (ex. PBC grease).

NOTE

○*When disassembling the brake hose and pipe, disassemble them by the unit as shown in the exploded view.*

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Pipe Joint Nuts	18	1.8	13	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Rear Master Cylinder Mounting Bolts	25	2.5	18	
4	Brake Pedal Bolt	8.8	0.90	78 in·lb	
5	Rear Master Cylinder Push Rod Locknut	17	1.7	13	
6	Rear Caliper Pin Bolt	27	2.8	20	Si
7	Bleed Valve	7.8	0.80	69 in·lb	
8	Rear Brake Pad Pin Plug	2.5	0.25	22 in·lb	
9	Rear Brake Pad Pin	17	1.7	13	
10	Rear Caliper Mounting Bolt	22	2.2	16	
11	Rear Brake Disc Mounting Bolts	27	2.8	20	L

12. ABS Hydraulic Unit
13. Rear Wheel Rotation Sensor

B: Apply brake fluid.
G: Apply grease.
R: Replacement Parts
Si: Apply silicone grease (ex. PBC grease).

NOTE

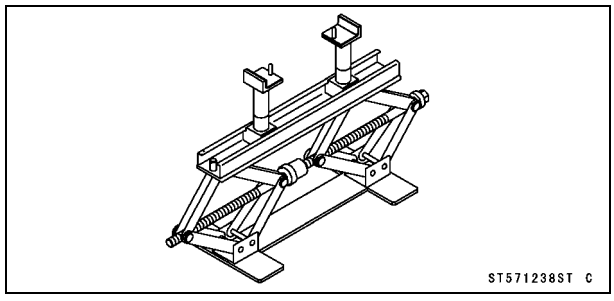
○*When disassembling the brake hose and pipe, disassemble them by the unit as shown in the exploded view.*

Specifications

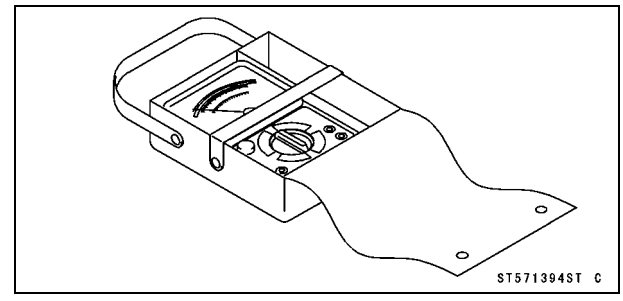
Item	Standard	Service Limit
Brake Lever, Brake Pedal		
Brake Lever Position	5-way adjustable (to suit rider)	– – –
Brake Lever Free Play	Non-adjustable	– – –
Pedal Free Play	Non-adjustable	– – –
Pedal Position	About 54 mm (2.1 in.) below footpeg top	– – –
Brake Pads		
Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Discs		
Thickness:		
Front	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Rear	5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)	5.5 mm (0.22 in.)
Runout	TIR 0.15 mm (0.006 in.) or less	TIR 0.3 mm (0.01 in.)
Brake Fluid		
Grade	DOT4	– – –
ABS		
Wheel Rotation Sensor Air Gap:		
Front	0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)	– – –
Rear	0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)	– – –

Special Tools

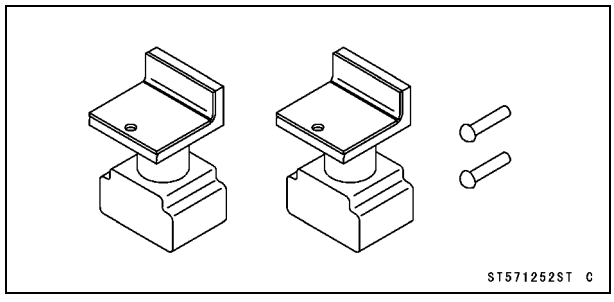
Jack:
57001-1238



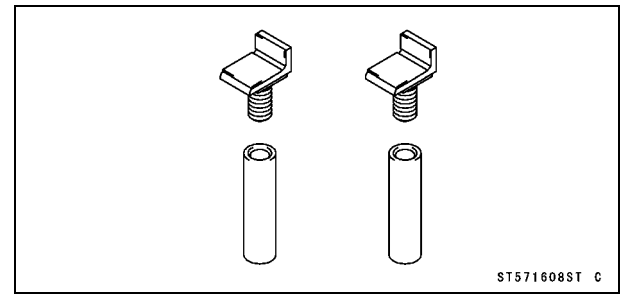
Hand Tester:
57001-1394



Attachment Jack:
57001-1252



Jack Attachment:
57001-1608



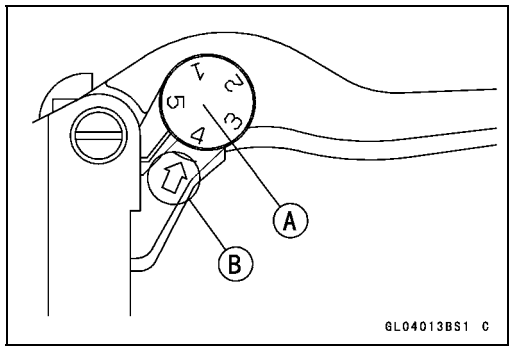
Brake Lever, Brake Pedal

Brake Lever Position Adjustment

The brake lever adjuster has 5 positions so that the brake lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.

○The distance from the grip to the lever is minimum at number 6 and maximum at number 1.



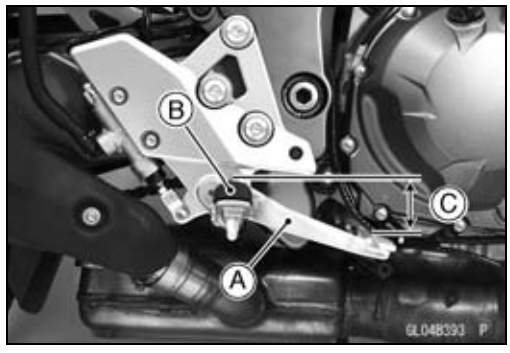
Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position.
  [B] Footpeg

Pedal Position

Standard: About 54 mm (2.1 in.) [C] below top of footpeg

★If it is incorrect, adjust the brake pedal position.



Brake Pedal Position Adjustment

NOTE

○*Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.*

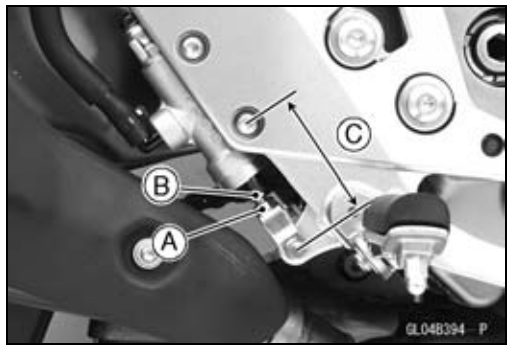
- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.

★If the length [C] shown is **70 ±1 mm (2.76 ±0.04 in.)**, the pedal position will be within the standard range.

- Tighten:

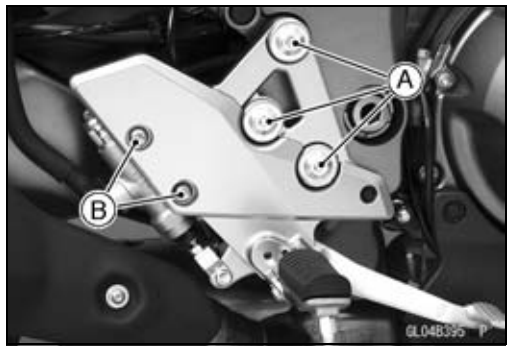
Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 13 ft·lb)

- Check the brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).



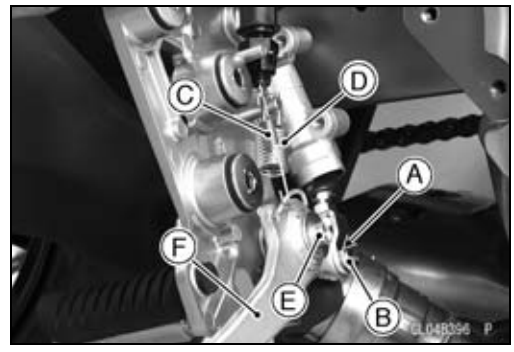
Brake Pedal Removal

- Remove:
  Right Front Footpeg Bracket Bolts [A]
  Rear Master Cylinder Mounting Bolts [B]



Brake Lever, Brake Pedal

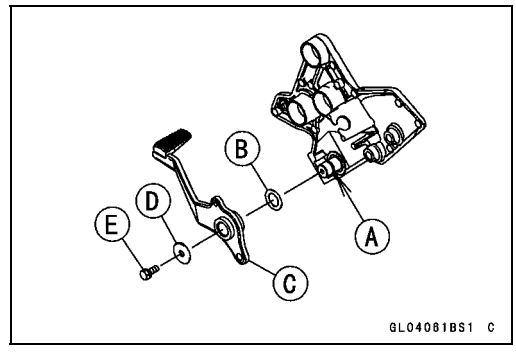
● Remove:
Cotter Pin [A]
Joint Pin [B]
Rear Brake Light Switch Spring [C]
Return Spring [D]
Brake Pedal Bolt [E]
Brake Pedal [F]



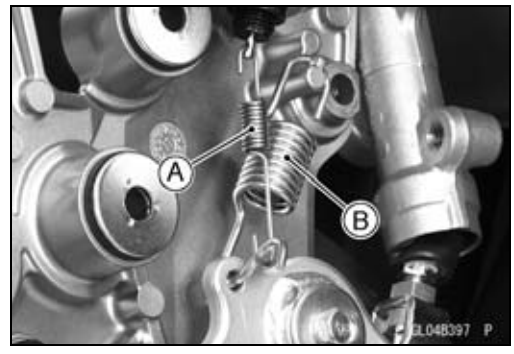
Brake Pedal Installation

● Apply grease to the footpeg pivot shaft [A].
● Install:
Washer [B]
Brake Pedal [C]
Washer [D]
● Apply a non-permanent locking agent to the threads of the brake pedal bolt [E], and tighten it.

Torque - Brake Pedal Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)



● Hook the shorter end of the rear brake light switch spring [A] on the brake light switch.
● Hook the upper end of the return spring [B] on the footpeg bracket hook.
○Face the both lower spring ends as shown.



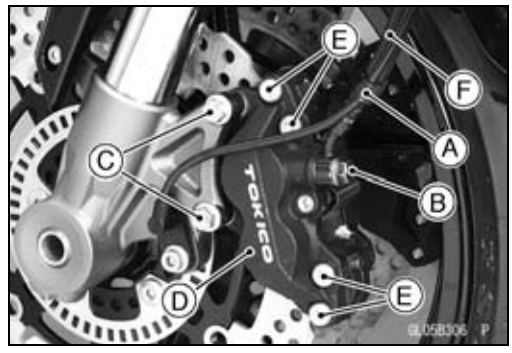
● Replace the cotter pin [A] with a new one.
● Insert the cotter pin and bend the pin ends [B].
● Install the front footpeg bracket and rear master cylinder.
● Tighten:

Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

● Check the brake pedal position (see Brake Pedal Position Inspection).

Calipers

Front Caliper Removal



- Remove the clamp [A] (Left Side Only).
- Loosen the banjo bolt [B] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [C], and detach the caliper [D] from the disc.

NOTICE

Do not loosen the caliper assembly bolts [E]. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leakage.

- Unscrew the banjo bolt and remove the brake hose [F] from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

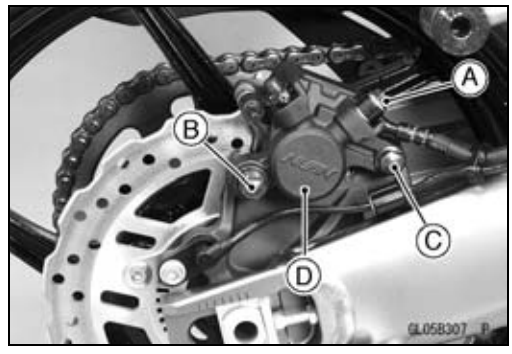
NOTICE

Immediately wash away any brake fluid that spills.

NOTE

○*If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).*

Rear Caliper Removal



- Remove the muffler body (see Muffler Body Removal in the Engine Top End chapter)
- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolt [B] and rear caliper pin bolt [C], and detach the caliper [D] from the disk.
- Unscrew the banjo bolt and remove the brake hose from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

NOTICE

Immediately wash away any brake fluid that spills.

NOTE

○*If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).*

Calipers

Caliper Installation

- Install the caliper and brake hose lower end.
  - ○Replace the washers on each side of hose fitting with new ones.
  - ○Apply silicone grease to the rear caliper pin bolt.
- Tighten:

Torque - Caliper Mounting Bolts
Front: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear: 22 N·m (2.2 kgf·m, 16 ft·lb)
Rear Caliper Pin Bolt: 27 N·m (2.8 kgf·m, 20 ft·lb)
Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

After servicing, it takes several applications of the brake lever or pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever or pedal is obtained by pumping the lever or pedal until the pads are against the disc.

Front Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Front Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Calipers

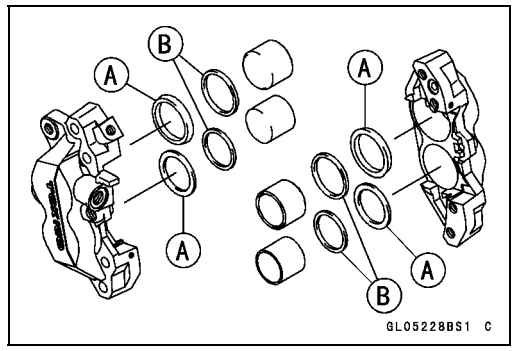
Caliper Fluid Seal Damage Inspection

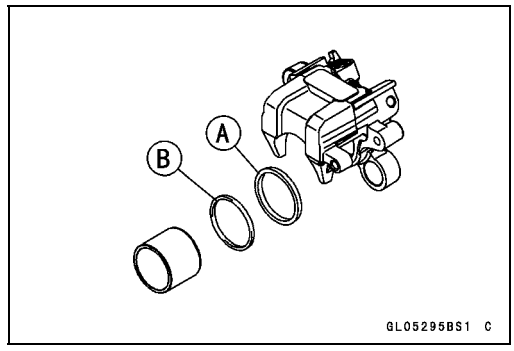
The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

- Replace the fluid seal if it exhibits any of the conditions listed below.

○Brake fluid leakage around the pad.
○Brakes overheat.
○Considerable difference in inner and outer pad wear.
○Seal and piston are stuck together.

★If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.

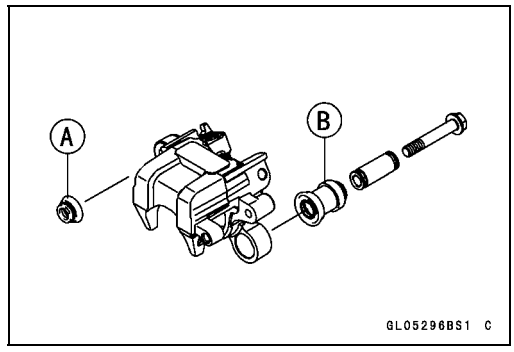




Rear Caliper Dust Boot and Friction Boot Damage Inspection

- Check that the dust boot [A] and friction boot [B] are not cracked, worn, swollen, or otherwise damaged.

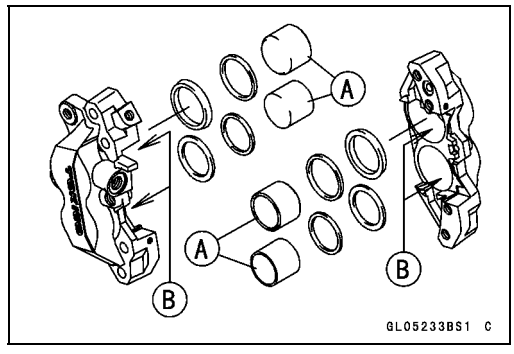
★If they show any damage, replace it.

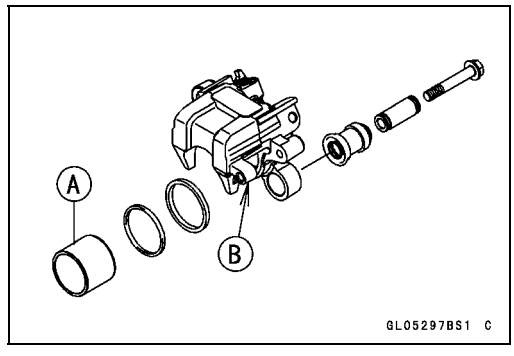


Caliper Piston and Cylinder Damage Inspection

- Visually inspect the pistons [A] and cylinder surfaces [B].

★Replace the caliper if the cylinder and piston are badly scores or rusty.

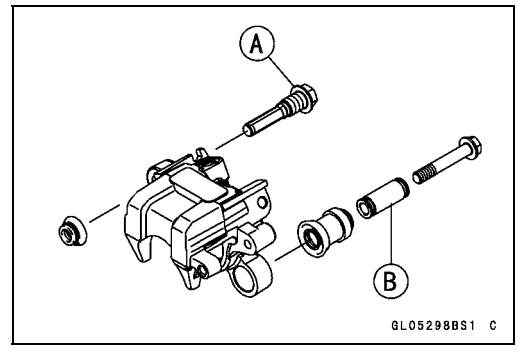




Calipers

Rear Caliper Holder Wear Inspection

The caliper body must slide smoothly on the rear caliper pin bolt [A] and sleeve [B]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.



- Check to see that the rear caliper pin bolt and the sleeve are not badly worn or stepped, and that the rubber boots are not damaged.

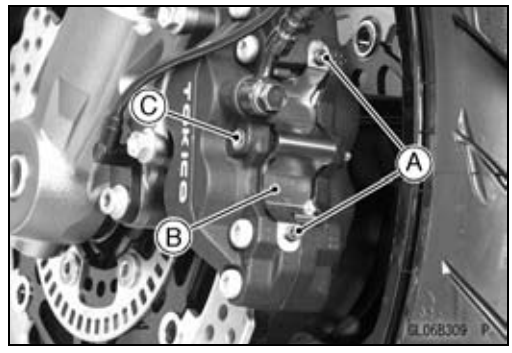
★If the rear caliper pin bolt is damaged, replace the rear caliper pin bolt.

★If the sleeve is damaged, replace the sleeve.

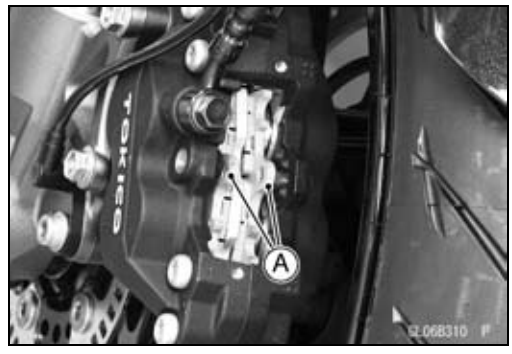
★If the rubber boots are damaged, replace the rubber boot.

Brake Pads

Front Brake Pad Removal



- Remove:
  Pad Spring Bolts [A]
  Pad Spring [B]
  Pad Pin [C]



- Remove the brake pads [A].

Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install:
  Brake Pads
  Pad Pin
- Tighten:

Torque - Front Brake Pad Pins: 15 N·m (1.5 kgf·m, 11 ft·lb)

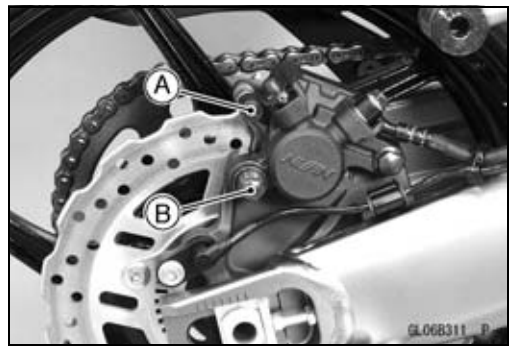
- Install the pad spring and bolts.
- Tighten:

Torque - Front Brake Pad Spring Bolts: 2.9 N·m (0.30 kgf·m, 26 in·lb)

⚠ WARNING

After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.

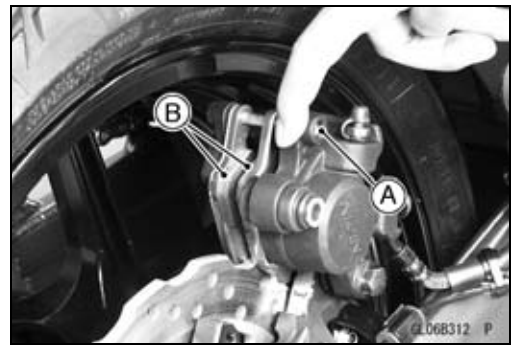
Rear Brake Pad Removal



- Remove the muffler body (see Muffler Body Removal in the Engine Top End chapter).
- Remove:
  Rear Brake Pad Pin Plug [A]
  Rear Caliper Mounting Bolt [B]

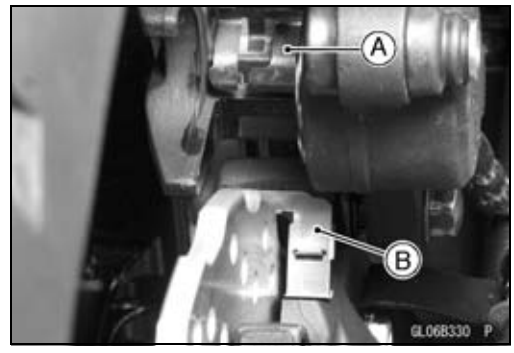
Brake Pads

- Pull up the caliper, remove the pad pin [A] and brake pads [B].



Rear Brake Pad Installation

- Check that the pad springs [A], [B] are in place on the caliper or bracket.
- Push the caliper piston in by hand as far as it will go.

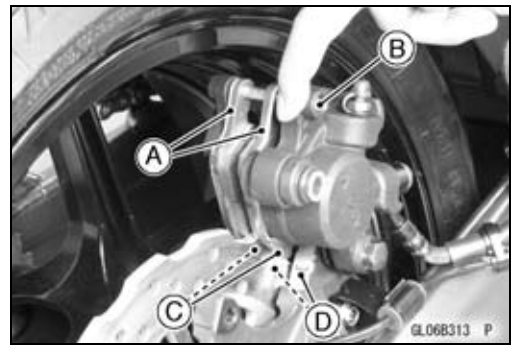


- Pull up the caliper, install the brake pads [A] and pad pin [B].

○Fit the projections [C] of the brake pad into the recesses [D] of the caliper bracket.

- Tighten:

Torque - Rear Caliper Mounting Bolt: 22 N·m (2.2 kgf·m, 16 ft·lb)
Rear Brake Pad Pin: 17 N·m (1.7 kgf·m, 13 ft·lb)
Rear Brake Pad Pin Plug: 2.5 N·m (0.25 kgf·m, 22 in·lb)



⚠ WARNING

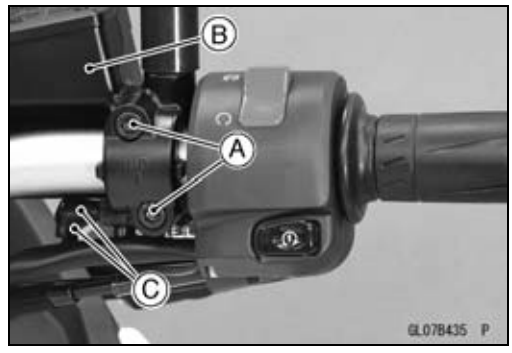
After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.

Brake Pad Wear Inspection

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

Master Cylinder

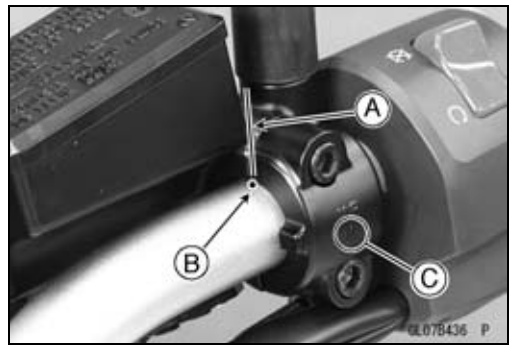
Front Master Cylinder Removal



- Remove the rear view mirror (see Rear View Mirror Removal in the Frame chapter).
- Remove the banjo bolt to disconnect the brake hose from the master cylinder (see Brake Hose Removal/Installation).
- Unscrew the clamp bolts [A], and take off the master cylinder [B] as an assembly with the reservoir, brake lever, and brake switch installed.
- Disconnect the front brake light switch connectors [C].

NOTICE
Immediately wash away any brake fluid that spills.

Front Master Cylinder Installation



- Set the front master cylinder to match its mating surface [A] to the punch mark [B] of the handlebars.
- The master cylinder clamp must be installed with the arrow mark [C] upward.
- Tighten the upper clamp bolt first, and then the lower clamp bolt.

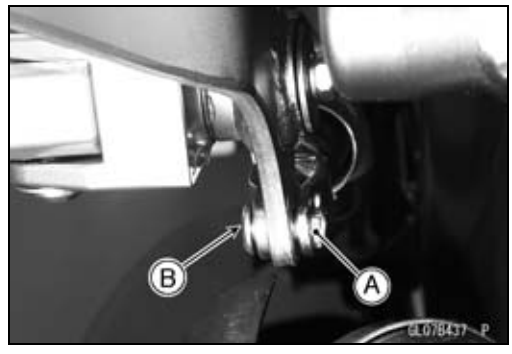
Torque - Front Master Cylinder Clamp Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Replace the washers that are on each side of the hose fitting with new ones.
- Tighten:

Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

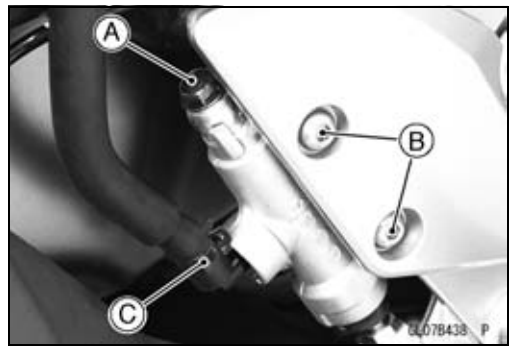
Rear Master Cylinder Removal



- Remove:
  Cotter Pin [A]
  Joint Pin [B]

NOTE

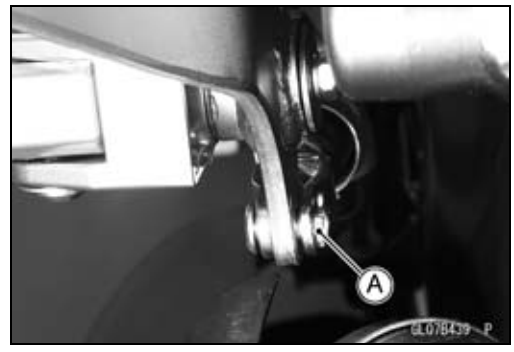
○*Pull off the joint pin while pressing down the brake pedal.*



- Unscrew the brake hose banjo bolt [A] on the master cylinder (see Brake Hose Replacement in the Periodic Maintenance chapter).
- Remove the master cylinder mounting bolts [B].
- Slide the reservoir hose lower end clamp [C].
- Pull off the reservoir hose lower end, and drain the brake fluid into a container.

Master Cylinder

Rear Master Cylinder Installation



- Replace the cotter pin [A] with a new one.

- Replace the washers on each side of hose fitting with new ones.
- Tighten:

Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)

NOTE

○*Depress the brake pedal [A] and then align the bolts holes of the master cylinder [B].*

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

Front Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Assembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder

Master Cylinder Inspection (Visual Inspection)

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders (see Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].

★If a master cylinder or piston shows any damage, replace them.

- Inspect the primary cup [C] and secondary cup [D].

★If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.

★If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.

- Check the dust covers [E] for damage.

★If they are damaged, replace them.

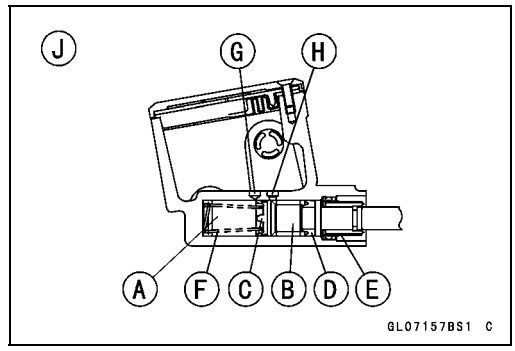
- Check the piston return springs [F] for any damage.

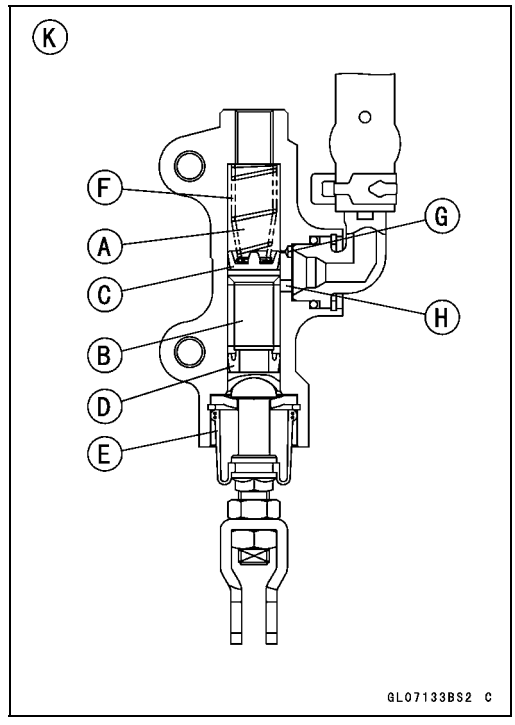
★If the springs are damaged, replace them.

- Check that relief port [G] and supply port [H] are not plugged.

★If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

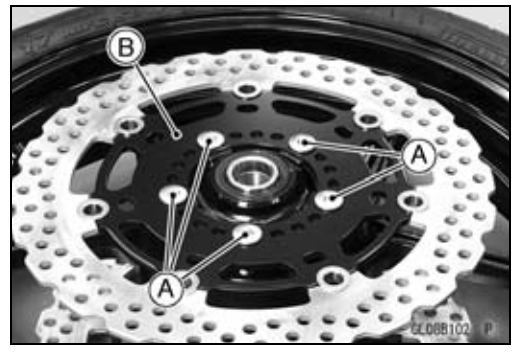
Front Master Cylinder [J]
Rear Master Cylinder [K]





Brake Disc

Brake Disc Removal



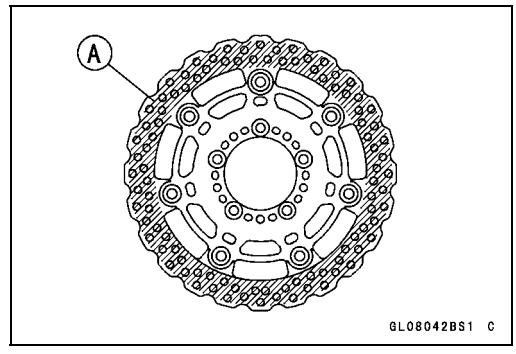
- Remove the wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc [B].
- Remove the gaskets (Front Only).

Brake Disc Installation

- Replace the gaskets with new ones (Front Only).
- Install the brake disc on the wheel so that the marked side [A] faces out.
- Apply a non-permanent locking agent to the threads of the front and rear brake disc mounting bolts, and tighten them.

Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)

Brake Disc Wear



- Measure the thickness of each disc at the point where it has worn the most.

★If the disc has worn past the service limit, replace it.
Measuring Area [A]

Brake Discs Thickness

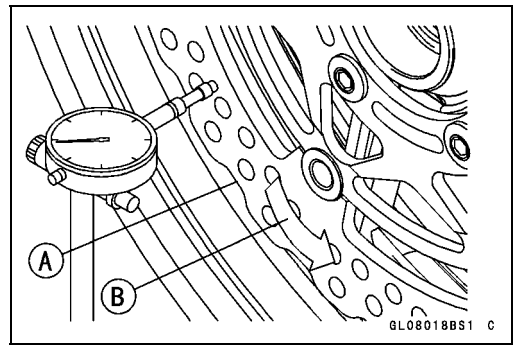
Standard:

Front	**4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)**
Rear	**5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)**

Service Limit:

Front	**4.5 mm (0.18 in.)**
Rear	**5.5 mm (0.22 in.)**

Brake Disc Warp



- Raise the front/rear wheel off the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1252
Jack Attachment: 57001-1608

○For front disc inspection, turn the handlebars fully to one side.

- Set up a dial gauge against the disc [A] as shown in the figure and measure disc runout, while turning [B] the wheel by hand.

★If runout exceeds the service limit, replace the disc.

Disc Runout

Standard:	**TIR 0.15 mm (0.006 in.) or less**
Service Limit:	**TIR 0.3 mm (0.01 in.)**

Brake Fluid

Brake Fluid Level Inspection

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

Brake Fluid Change

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

Brake Line Bleeding

The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

⚠ WARNING

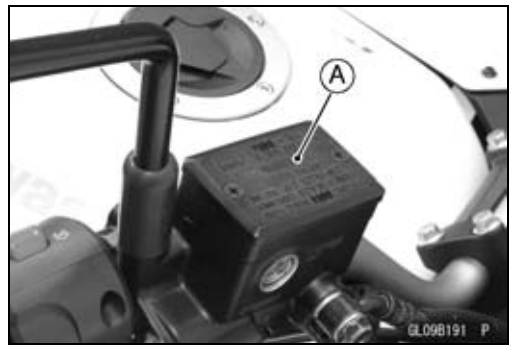
Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If the brake lever or pedal has a soft or "spongy" feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.

NOTE

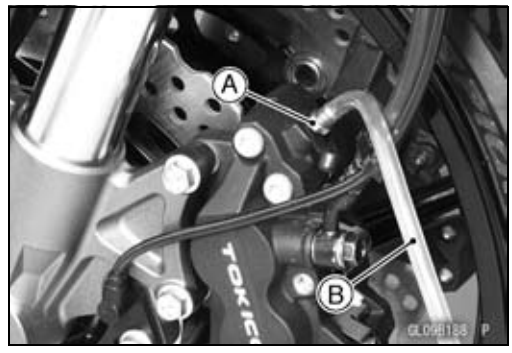
○*The procedure to bleed the front brake line is as follows. Bleeding the rear brake line is the same as for the front brake.*

- Remove the reservoir cap [A] and diaphragm.
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.

○Bleed the air completely from the master cylinder by this operation.



- Remove the rubber cap from the bleed valve [A] on the caliper.
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.



Brake Fluid

- Bleed the brake line and the caliper.

○Repeat this operation until no more air can be seen coming out into the plastic hose.

1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
2. Quickly open and close [B] the bleed valve while holding the brake applied.
3. Release the brake [C].

NOTE

○*The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

○*Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.*

○*Front Brake: First bleeding the right caliper then repeat the above steps for the left calper.*

- Remove the clear plastic hose.
- Check the fluid level (see Brake Fluid Level Inspection in the Periodic Maintenance chapter).
- Install the diaphragm and reservoir cap.
- Tighten:

Torque - Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)

Brake Fluid

⚠ WARNING

When working with the disc brake, observe the precautions listed below.

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE**.

Brake Hose

Brake Hose Removal/Installation

- Refer to the Brake Hose Replacement in the Periodic Maintenance chapter.

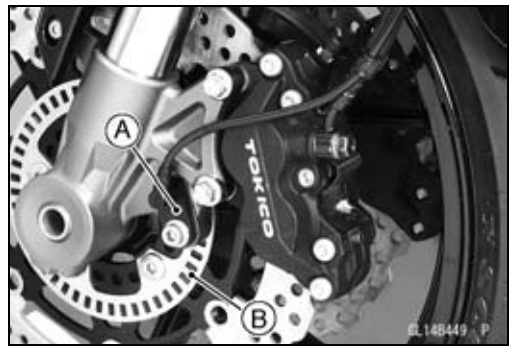
Brake Hose and Pipe Inspection

- Refer to the Brake Hose and Pipe Damage and Installation Condition Inspection in the Periodic Maintenance chapter.

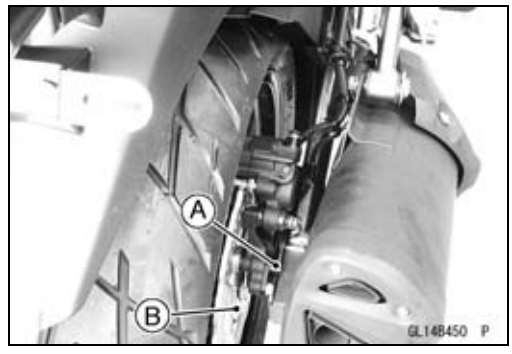
Anti-Lock Brake System

Parts Location

Front Wheel Rotation Sensor [A]
Front Wheel Rotation Sensor Rotor [B]

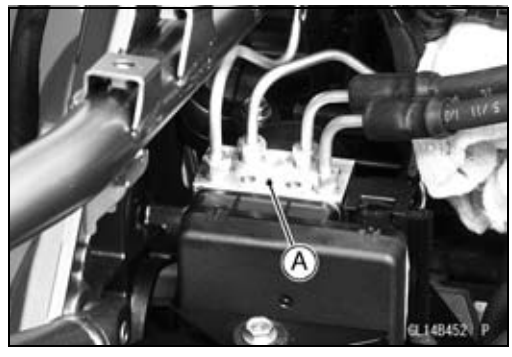


Rear Wheel Rotation Sensor [A]
Rear Wheel Rotation Sensor Rotor [B]

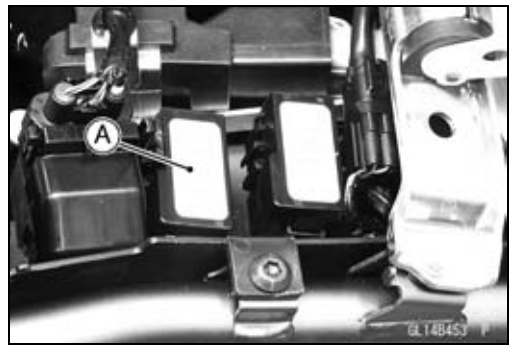


Yellow ABS Indicator Light [A]

ABS Hydraulic Unit [A]

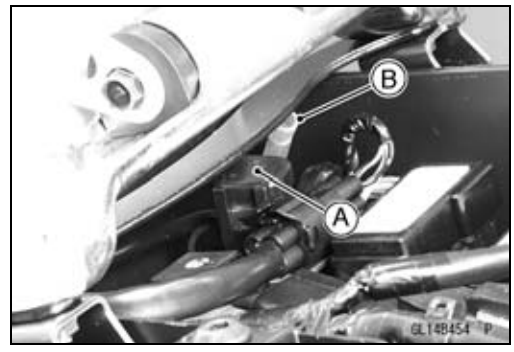


Fuse Box 2 [A]



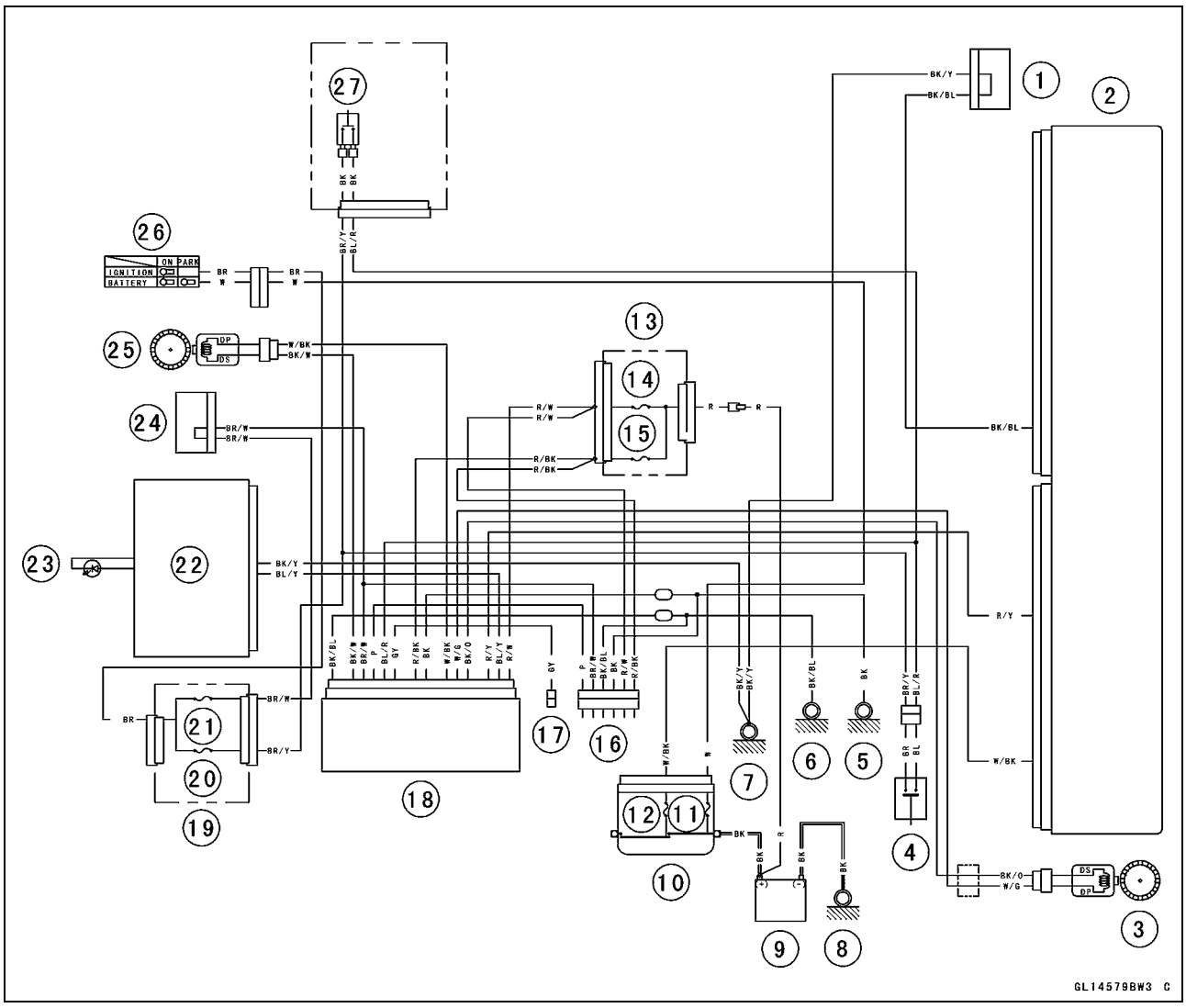
Anti-Lock Brake System

ABS Kawasaki Diagnostic System Connector [A]
ABS Self-diagnosis Terminal [B]



Anti-Lock Brake System

ABS System Wiring Diagram



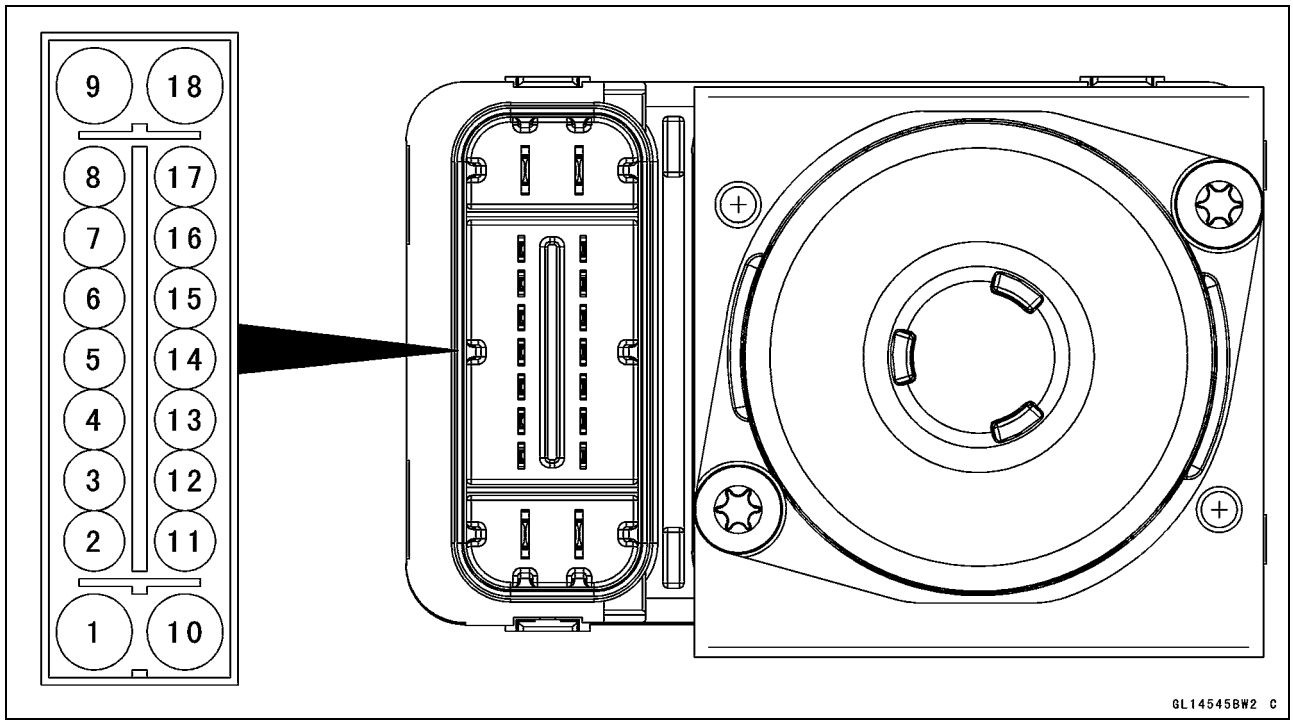
1. Joint Connector E
2. ECU
3. Rear Wheel Rotation Sensor
4. Rear Brake Light Switch
5. Frame Ground 5
6. Frame Ground 4
7. Frame Ground 1
8. Engine Ground
9. Battery 12 V 8 Ah
10. Starter Relay
11. Main Fuse 30 A
12. ECU Fuse 15 A
13. Fuse Box 2
14. ABS Motor Relay Fuse 25 A
15. ABS Solenoid Valve Relay Fuse 15 A
16. ABS Kawasaki Self-diagnosis System Connector
17. ABS Self-diagnosis Terminal
18. ABS Hydraulic Unit
19. Fuse Box 1
20. Brake Light/Horn Fure 7.5 A
21. Ignition Fuse 15 A
22. Meter Unit
23. Yellow ABS Indicator Light (LED)
24. Joint Connector F
25. Front Wheel Rotation Sensor
26. Ignition Switch
27. Front Brake Light Switch

○Color Codes:

BK: Black	GY: Gray	PU: Purple
BL: Blue	LB: Light Blue	R: Red
BR: Brown	LG: Light Green	V: Violet
CH: Chocolate	O: Orange	W: White
DG: Dark Green	P: Pink	Y: Yellow
G: Green		

Anti-Lock Brake System

ABS Hydraulic Unit Terminal Names



1. Ground: BK/BL
2. Unused
3. Front Wheel Rotation Sensor Signal Input: BK/W
4. Power Supply: BR/W
5. ABS Kawasaki Self-Daignosis System Terminal: P
6. Front and Rear Brake Light Switch Signal: BL/R
7. ABS Self-Daiagnosis Terminal: GY
8. Front Wheel Rotation Sensor Signal Output: G/Y
9. Power Supply to ABS Solenoid Valve Relay: R/BK
10. Ground to Motor: BK
11. Unused
12. Power Supply to Front Wheel Rotation Sensor: W/BK
13. Power Supply to Rear Wheel Rotation Sensor: W/G
14. Rear Wheel Rotation Sensor Signal Input: BK/O
15. Unused
16. Rear Wheel Rotation Sensor Signal Output: R/Y
17. Yellow ABS Warning Indicator Light: BL/Y
18. Power Supply to ABS Motor Relay: R/W

Anti-Lock Brake System

ABS Servicing Precautions

There are a number of important precautions that should be followed servicing the ABS system.

- This ABS system is designed to be used with a 12 V sealed battery as its power source. Do not use any other battery except for a 12 V sealed battery as a power source.
- Do not reverse the battery cable connections. This will damage the ABS hydraulic unit.
- To prevent damage to the ABS parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is ON or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Do not turn the ignition switch to ON while any of the ABS electrical connectors are disconnected. The ABS hydraulic unit memorizes service codes.
- Do not spray water on the electrical parts, ABS parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the ABS system is not influenced by electric wave radiated from the antenna. Locate the antenna as far as possible away from the ABS hydraulic unit.
- Whenever the ABS electrical connections are to be disconnected, first turn off the ignition switch.
- The ABS parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- The ABS parts cannot be disassembled. Even if a fault is found, do not try to disassemble and repair the ABS parts, replace it.
- The ABS has many brake lines, pipes, and leads. And the ABS cannot detect problems with the conventional braking system (brake disc wear, unevenly worn brake pad, and other mechanical faults). To prevent trouble, check the brake lines and pipes for correct routing and connection, the wiring for correct routing, and the brakes for proper braking power. Be sure to check for fluid leakage, and bleed the brake line thoroughly.

Anti-Lock Brake System

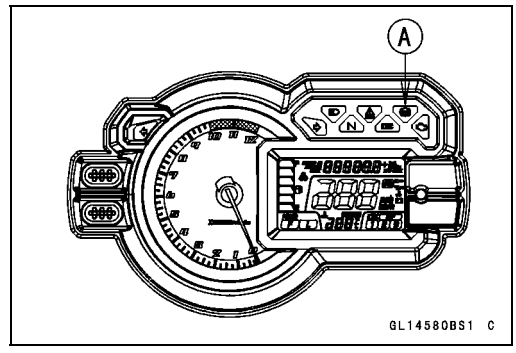
⚠ WARNING

Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If any of the brake line fittings, including the ABS hydraulic unit joint nuts, or the bleed valve is opened at any time, the air must be bled completely from the brake line. If the brake lever has a soft or "spongy" feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.

NOTICE

Do not ride the motorcycle with air in the brake line, or the ABS could malfunction.

○The Yellow ABS indicator light (LED) [A] may light if the tire pressure is incorrect, a non-recommended tire is installed, or the wheel is deformed. If the indicator light lights, remedy the problem and clear the service code.



⚠ WARNING

Use of non-recommended tires may cause malfunctioning of ABS and can lead to extended braking distance resulting in an accident causing serious injury or death. Always use recommended standard tires for this motorcycle.

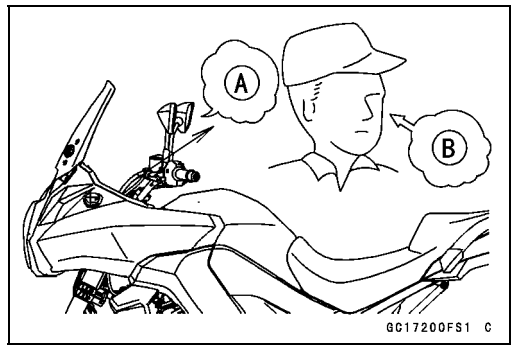
Anti-Lock Brake System

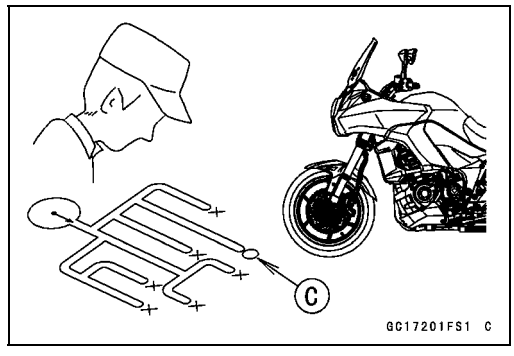
○The yellow ABS indicator light (LED) may come on if the engine is run with the motorcycle on its stand and the transmission in gear. If the indicator light comes on, just turn the ignition switch OFF, then clear service code 42, which indicates a “Faulty front wheel rotation sensor”.
○When the ABS operates, the ABS makes noise and the rider feels the reaction force on the brake lever and brake pedal. This is a normal condition. It informs the rider that the ABS is operating normally.
○Service codes detected once by the ABS hydraulic unit will be memorized in the ABS hydraulic unit. Therefore, after maintenance work is finished, be sure to erase the service codes. Do not erase the service codes during troubleshooting. Wait until all the checks and repair work are finished to prevent duplication of previous service codes and unnecessary maintenance work.
○Before delivering the motorcycle to the customer, be sure to erase any service codes which might be stored in the ABS hydraulic unit. Using the self-diagnosis feature, make sure that the yellow ABS indicator light (LED) lights. A fully charged battery is a must for conducting reliable self-diagnosis. Test run the motorcycle at a speed of more than 20 km/h (12 mph) to see that the yellow ABS indicator light (LED) does not come on. Finally, test run the motorcycle at a speed of more than 30 km/h (20 mph) and brake suddenly to see that the motorcycle stops without loss of steering control and the ABS operates normally (The reaction force generated is felt in the brake lever and pedal.). This completes the final inspection.

ABS Troubleshooting Outline

When an abnormality in the system occurs, the yellow ABS indicator light (LED) lights up to alert the rider. In addition, the nature of the fault is stored in the memory of the ABS hydraulic unit and when in the self-diagnosis mode, the service code [A] is indicated by the number of times the yellow ABS indicator light (LED) blinks. The service codes stored in memory are not erased until the mode has been changed to the fault erase mode after the fault has been corrected. Therefore, after correcting the problem, always erase the service codes and then run the self-diagnosis program to confirm normal signal output. When, due to a malfunction, the yellow ABS indicator light (LED) remains lit, get a thorough understanding of the background before starting the repair work. Ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C]. Do not rely solely on the ABS self-diagnosis function, use common sense; check the brakes for proper braking power, and brake fluid level, search for leaks, etc.

If the yellow ABS indicator light (LED) blinks when the ignition switch is turned to ON or the motorcycle is running, ABS system does not function. In this case, the voltage of the battery is extremely low.





Anti-Lock Brake System

Even when the ABS is operating normally, the yellow ABS indicator light (LED) may light up under the conditions listed below. Turn the ignition switch OFF to stop the indicator light. If the motorcycle runs without erasing the service code, the light may light up again.

○After continuous riding on a rough road.
○When the engine is started with the stand raised and the transmission engaged, and the rear wheel turns.
○When accelerating so abruptly that the front wheel leaves the ground.
○When the ABS has been subjected to strong electrical interference.
○When tire pressure is abnormal. Adjust tire pressure.
○When a tire different in size from the standard size is being used. Replace with standard size.
○When the wheel is deformed. Replace the wheel.

Much of the ABS troubleshooting work consists of confirming continuity of the wiring. The ABS parts are assembled and adjusted by the manufacturer, so there is no need to disassemble or repair them. Replace the ABS hydraulic unit.

The basic troubleshooting procedures are listed below.

● Carry out pre-diagnosis inspections as a preliminary inspection.
● Determine the fault using the self-diagnosis function.
● Check wiring and connections from the ABS hydraulic unit connector to the suspected faulty ABS part, using the hand tester.

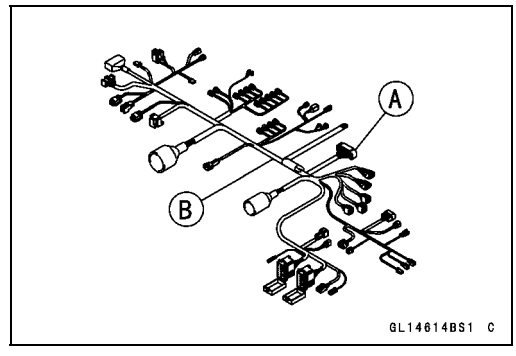
Special Tool - Hand Tester: 57001-1394

● Visually inspect the wiring for signs of burning or fraying.
★If any wiring is poor, replace the damaged wiring.
● Pull each connector [A] apart and inspect it for corrosion, dirt and damage.
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
● Check the wiring for continuity.
○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
○Connect the hand tester between the ends of the leads.

Special Tool - Hand Tester: 57001-1394

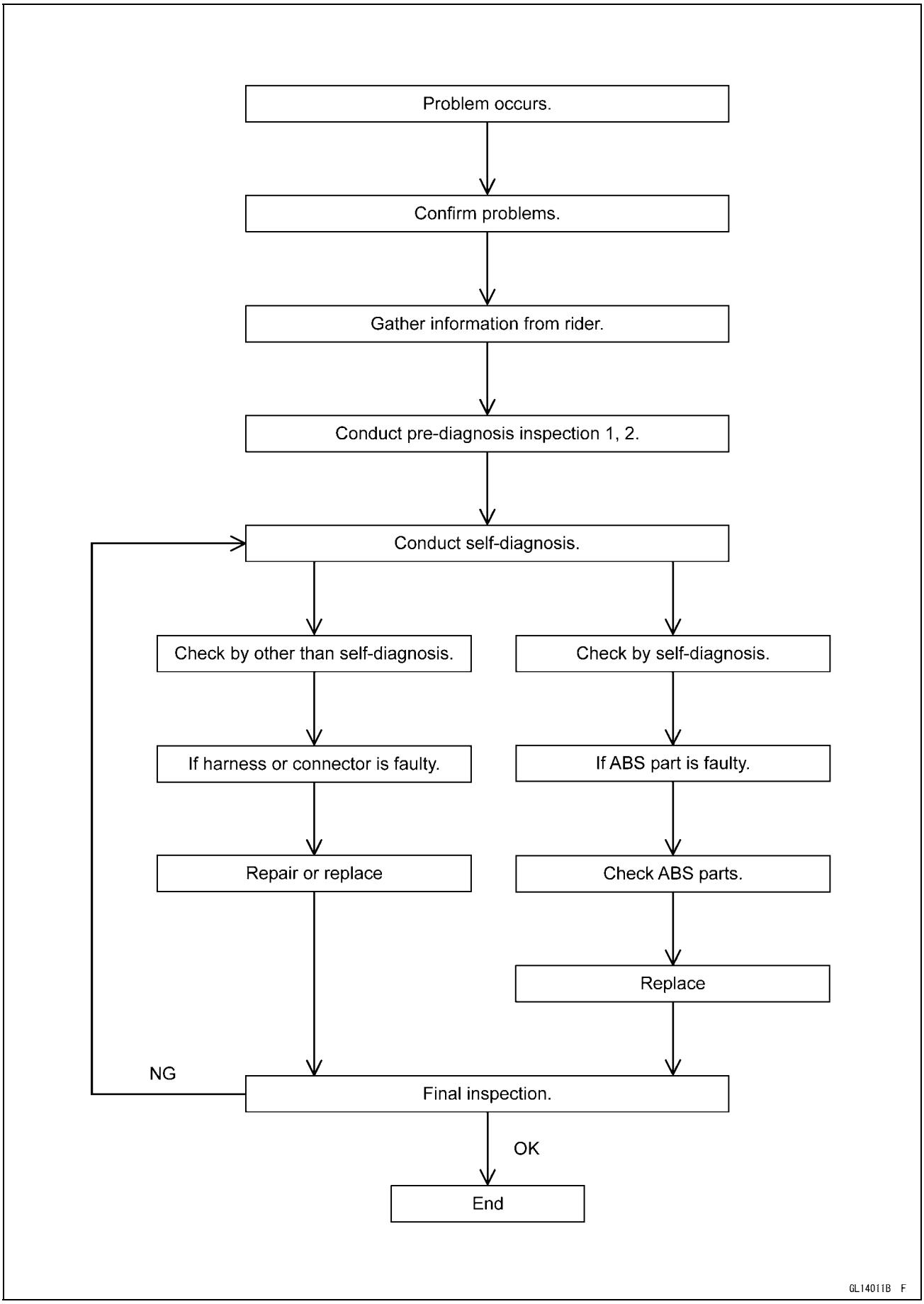
○Set the tester to the × 1 Ω range, and read the tester.
★If the tester does not read 0 Ω, the lead is defective. Replace the main harness [B] if necessary.

● Narrow down suspicious parts and close in on the faulty ABS part by repeating the continuity tests.
★If no abnormality is found in the wiring or connectors, the ABS parts are the next likely suspects. Check each part one by one.
★If an abnormality is found, replace the affected ABS part.



Anti-Lock Brake System

ABS Diagnosis Flow Chart



Anti-Lock Brake System

Inquiries to Rider

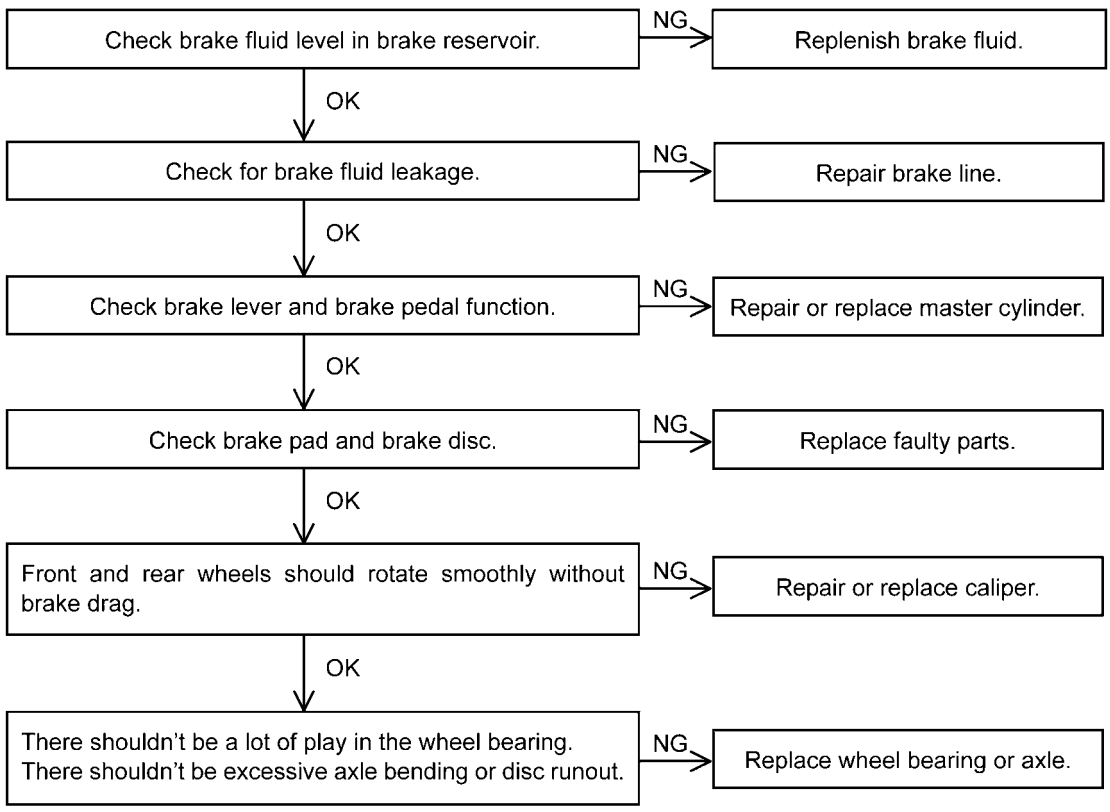
○Each rider reacts to problems in different ways, so it is important to confirm what kind of condition the rider is dissatisfied with.
○Try to find out exactly what problem occurs under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem in the shop.
○The diagnosis sheet will help prevent you from overlooking any keys, so always use it.

Sample Diagnosis Sheet

<table>
<tr><td colspan="3">Rider name:</td><td colspan="5">Registration No. (license plate No.):</td></tr>
<tr><td colspan="3">Year of initial registration:</td><td colspan="5">Model:</td></tr>
<tr><td colspan="3">Engine No.:</td><td colspan="5">Frame No.:</td></tr>
<tr><td colspan="3">Date problem occurred:</td><td colspan="5">Frequency:</td></tr>
<tr><td colspan="3">Weather:</td><td colspan="5">Mileage:</td></tr>
<tr><td rowspan="2">Phenomenon</td><td>☐ Brake lever vibration or noise</td><td>☐ Yellow ABS indicator light (LED) blinks</td><td rowspan="2">☐ Braking distance too long</td><td>☐ Abnormal brake lever movement</td><td rowspan="2">☐ ABS not working</td><td rowspan="2">☐ ABS works but yellow ABS indicator light (LED) doesn't light up</td><td rowspan="2">☐ ABS operating too frequently</td></tr>
<tr><td>☐ Pedal vibration or noise</td><td>☐ Yellow ABS indicator light (LED) remains lit up</td><td>☐ Abnormal pedal movement</td></tr>
<tr><td colspan="2">Engine conditions at problem</td><td colspan="2">☐ At start-up</td><td colspan="2">☐ After starting</td><td colspan="2">☐ At 5 000 r/min (rpm) or more</td></tr>
<tr><td colspan="2">Road conditions</td><td colspan="6">☐ Slippery road (☐ snow, ☐ gravel, ☐ other)
☐ Rough surface
☐ Other</td></tr>
<tr><td colspan="2">Driving conditions</td><td colspan="6">☐ High-speed cornering
☐ Driving 10 km/h (6 mph) or above
☐ Driving below 10 km/h (6 mph)
☐ When stopping
☐ When turning</td></tr>
<tr><td colspan="2">Brake application</td><td colspan="6">☐ Gradual
☐ Abrupt</td></tr>
<tr><td colspan="2">Other conditions</td><td colspan="6">☐ Large brake lever stroke
☐ Large pedal stroke</td></tr>
</table>

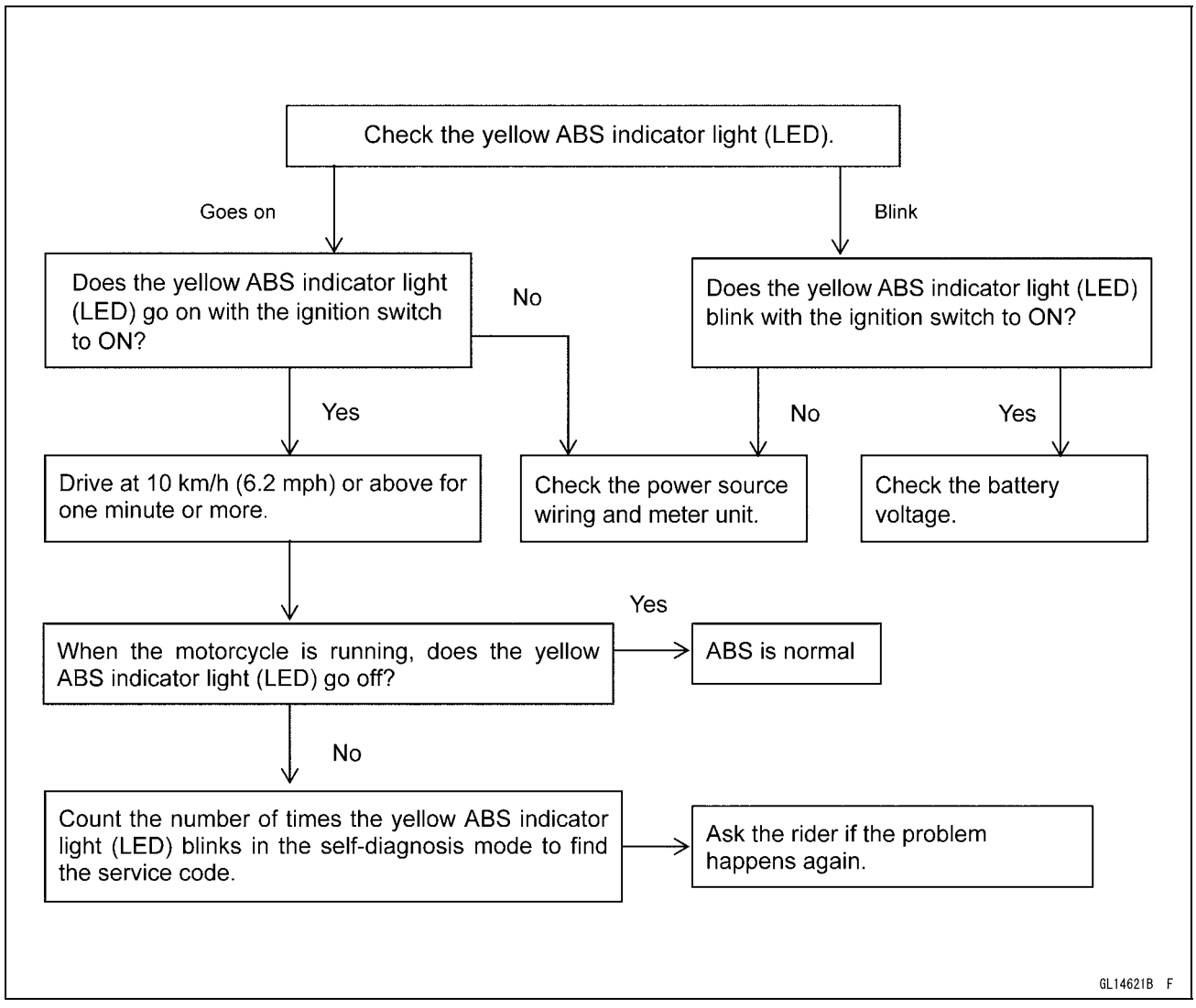
Anti-Lock Brake System

Pre-Diagnosis Inspection 1



Anti-Lock Brake System

Pre-Diagnosis Inspection 2


Check the yellow ABS indicator light (LED).
Goes on
Blink
Does the yellow ABS indicator light (LED) go on with the ignition switch to ON?
No
Does the yellow ABS indicator light (LED) blink with the ignition switch to ON?
Yes
No
Yes
Drive at 10 km/h (6.2 mph) or above for one minute or more.
Check the power source wiring and meter unit.
Check the battery voltage.
Yes
When the motorcycle is running, does the yellow ABS indicator light (LED) go off?
ABS is normal
No
Count the number of times the yellow ABS indicator light (LED) blinks in the self-diagnosis mode to find the service code.
Ask the rider if the problem happens again.
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Self-diagnosis Outline

When the indicator light has blinked or come on, the ABS hydraulic unit memorizes and stores the service code (19 codes including “Normal Code”) for the service person to troubleshoot easily. The service code memory is powered directly by the battery and cannot be canceled by the ignition switch.

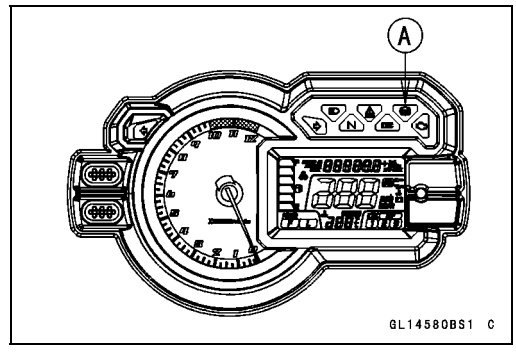
The ABS hydraulic unit can memorize up to all service codes (19 codes). Further service codes are memorized after erasing the preceding all service codes (19 codes). If there is no fault, only the start code 12 is shown, indicating that “The ABS is normal”.

Self-diagnosis Procedures

○When a problem occurs with the ABS system, the yellow ABS indicator light (LED) [A] lights.

NOTE

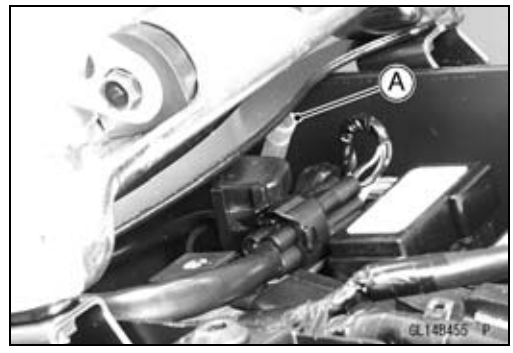
- ○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the light blinks very slowly or doesn’t blink.*
- ○*The motorcycle is stopped.*
- ○*Keep the self-diagnosis terminal grounded during self -diagnosis, with an auxiliary lead.*



Anti-Lock Brake System

- Remove the seat (see Seat Removal in the Frame chapter).
- Turn the ignition switch to ON
- Ground the self-diagnosis terminal [A] (Gray) to the battery (–) terminal, using a suitable lead.

○Count the blinks of the light to read the service code. Keep the auxiliary lead ground until you finish reading the service code.



Service Code Clearing Procedures

- Start the service code erase mode with the following procedure.

○The erase mode starts when the ABS self-diagnosis terminal is disconnected from the ground terminal after starting the self-diagnosis mode.

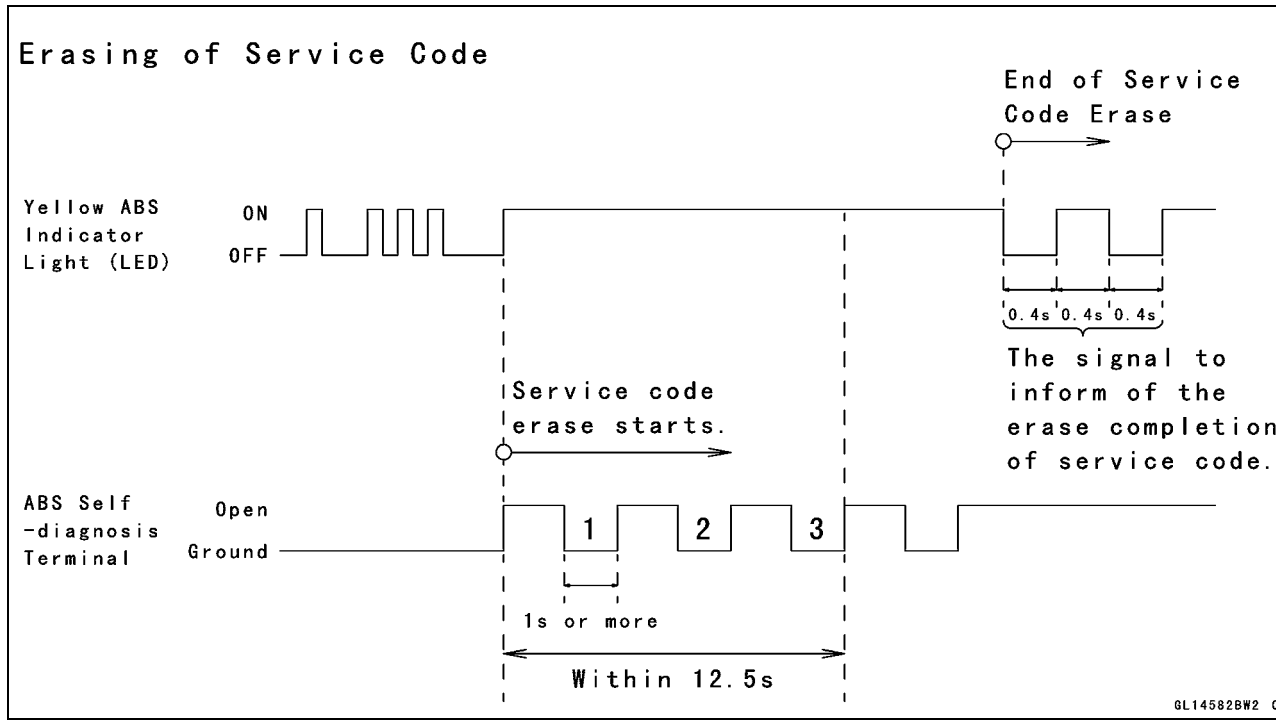
○The service code can be erased by grounding and ungrounding (each time for at least one second) the ABS self-diagnosis terminal three times within about 12.5 seconds after starting the erase mode.

○The yellow ABS indicator light (LED) remains lit during the erase mode.

○After erasing, the yellow ABS indicator light (LED) blinks and lights.

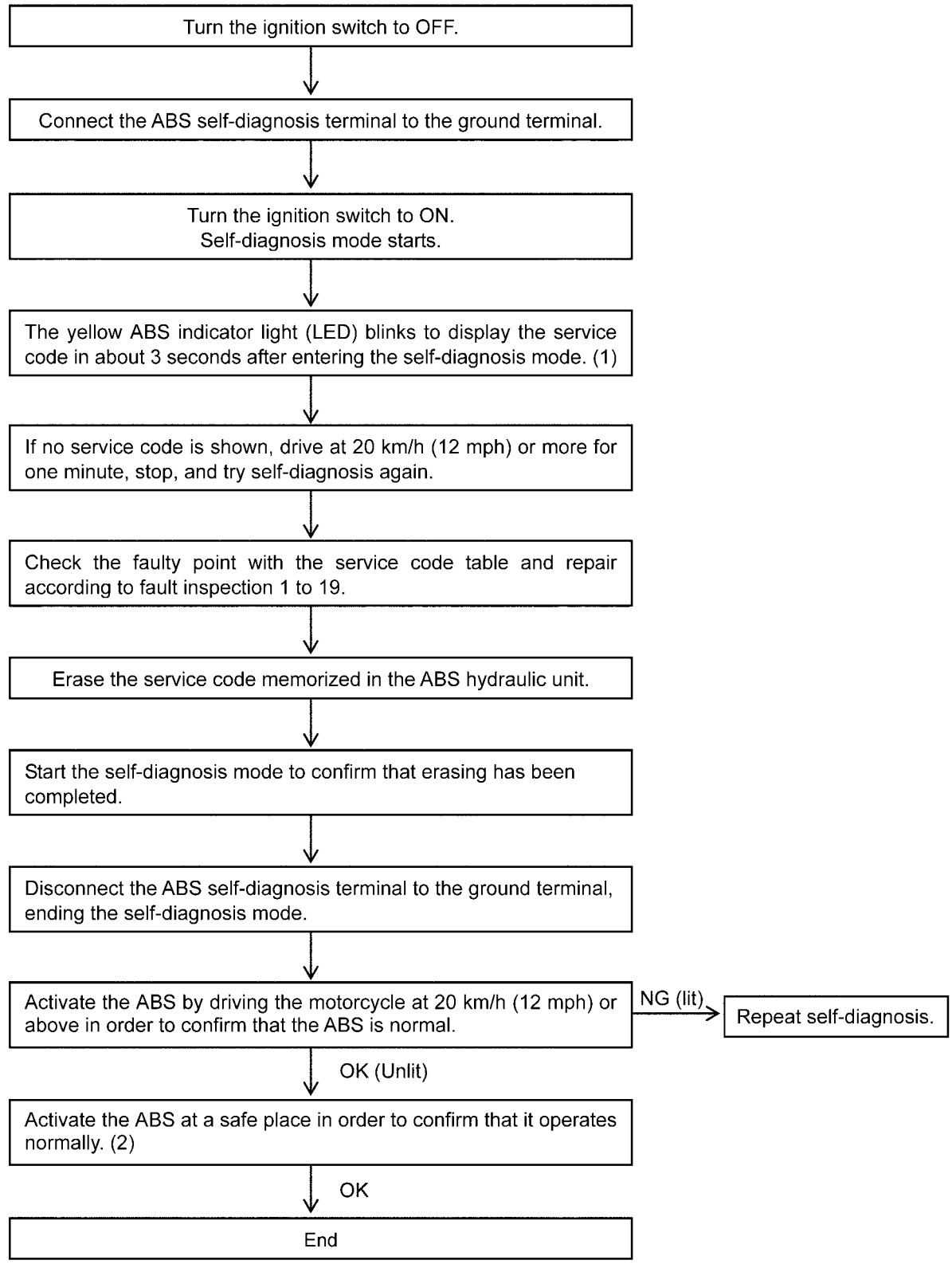
○Once erasing is finished, enter the self-diagnosis mode again to confirm that the service codes have been erased. If the ABS has been reset and all codes have been erased, only start code 12 will be shown.

Anti-Lock Brake System



Anti-Lock Brake System

Self-diagnosis Flow Chart


Turn the ignition switch to OFF.
Connect the ABS self-diagnosis terminal to the ground terminal.
Turn the ignition switch to ON.
Self-diagnosis mode starts.
The yellow ABS indicator light (LED) blinks to display the service code in about 3 seconds after entering the self-diagnosis mode. (1)
If no service code is shown, drive at 20 km/h (12 mph) or more for one minute, stop, and try self-diagnosis again.
Check the faulty point with the service code table and repair according to fault inspection 1 to 19.
Erase the service code memorized in the ABS hydraulic unit.
Start the self-diagnosis mode to confirm that erasing has been completed.
Disconnect the ABS self-diagnosis terminal to the ground terminal, ending the self-diagnosis mode.
Activate the ABS by driving the motorcycle at 20 km/h (12 mph) or above in order to confirm that the ABS is normal.
NG (lit)
Repeat self-diagnosis.
OK (Unlit)
Activate the ABS at a safe place in order to confirm that it operates normally. (2)
OK
End

(1): The self-diagnosis mode ends following.
When the ignition switch is OFF.
When the motorcycle is driven while in the self-diagnosis mode.
When the self-diagnosis terminal disconnects.

(2): Apply brake suddenly at 30 km/h (19 mph) or more to confirm that the motorcycle stops smoothly and steady with pulsation on the brake lever and pedal.

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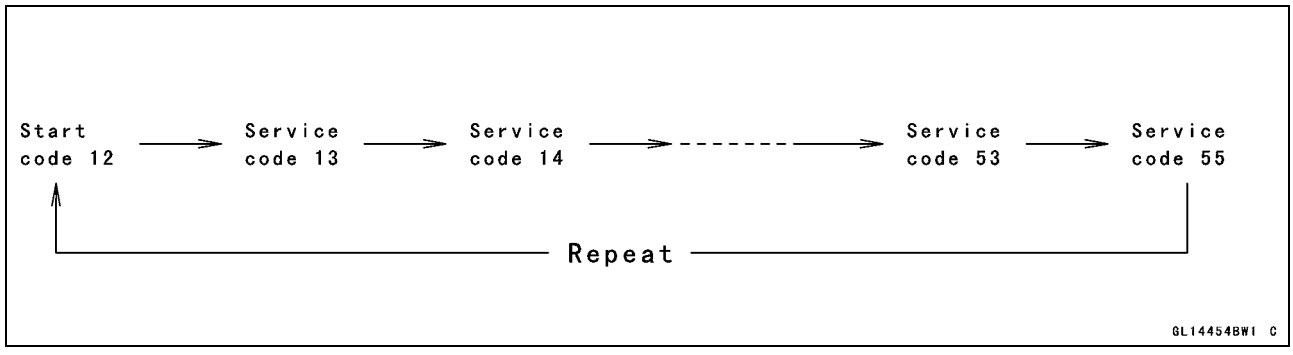
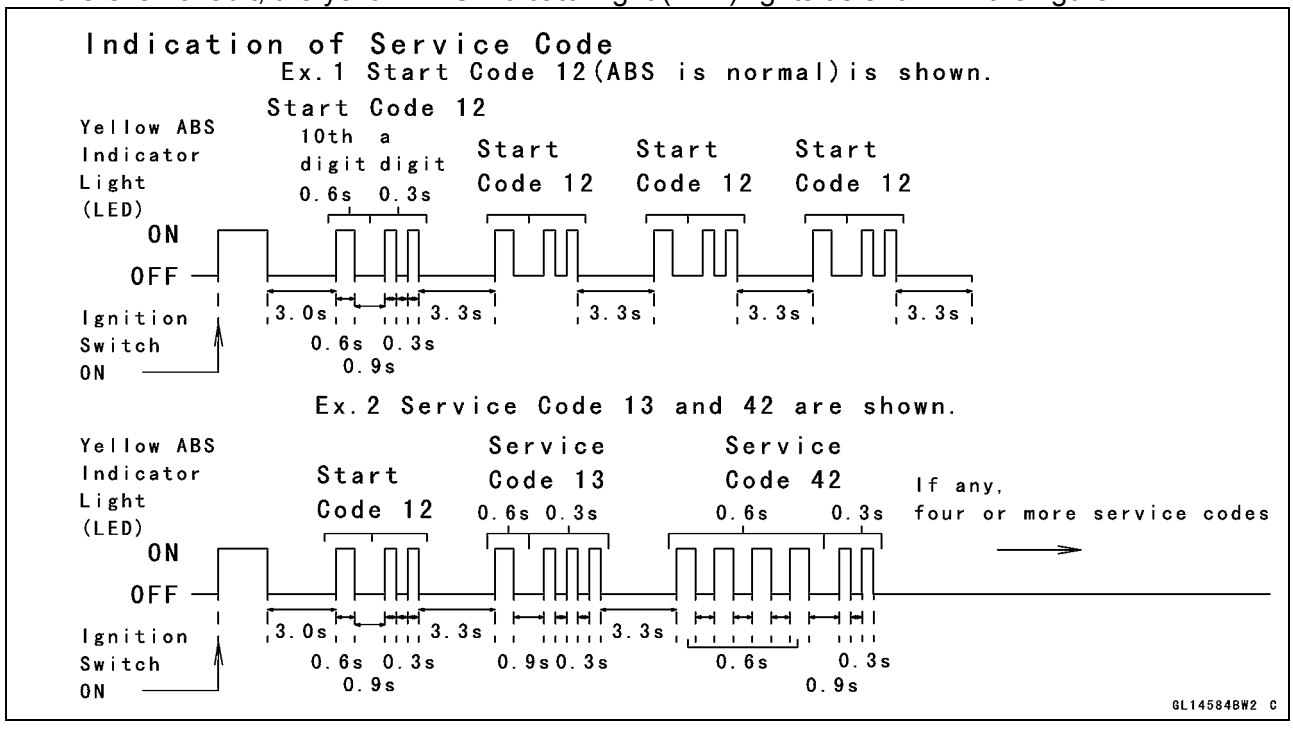
Anti-Lock Brake System

How to Read Service Codes

○Service codes are shown by a series of long and short blinks of the yellow ABS indicator light (LED) as shown below.
○Read 10th digit and unit digit as the yellow ABS indicator light (LED) blinks.
○When there are a number of faults, a maximum of all service codes (19 codes) can be stored and the display will begin starting from the small number code entered.
○For the display pattern, first the smallest number code is shown, next up to all service codes (19 codes) starting with the last one stored, then the display is repeated from the smallest number code once again.



○If there is no fault, the yellow ABS indicator light (LED) lights as shown in the figure.

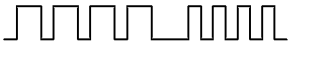


How to Erase Service Codes

○Even if the ignition switch is turned to OFF, the battery or the ABS hydraulic unit are disconnected, all service codes remain in the ABS hydraulic unit.
○Refer to the Service Code Clearing Procedure for the service code erasure.

Anti-Lock Brake System

Service Code Table

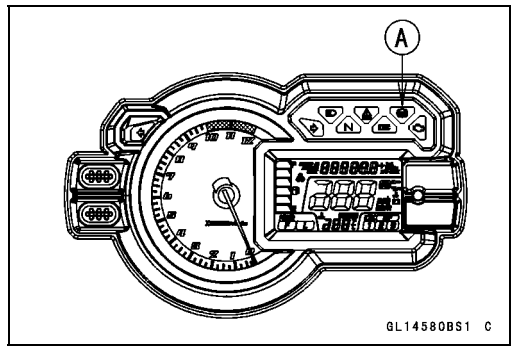
Service Code	Yellow ABS Indicator Light (LED)	Problems	Light State
12		Start code (not fault)	After starts, turn off
13		Rear inlet solenoid valve trouble (shorted or open, stuck valve)	ON
14		Rear outlet solenoid valve trouble (shorted or open, stuck valve)	ON
17		Front inlet solenoid valve trouble (shorted or open, stuck valve)	ON
18		Front outlet solenoid valve trouble (shorted or open, stuck valve)	ON
19		ABS solenoid valve relay trouble (wiring shorted or open, stuck relay)	ON
25		Front, rear tire abnormal (substandard tire, deformation wheel, sensor rotor teeth number wrong)	ON
35		ABS motor relay trouble (wiring shorted, open or lock, stuck relay)	ON
42		Front wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)	ON
43		Front wheel rotation sensor wiring abnormal (wiring shorted or open)	ON
44		Rear wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)	ON
45		Rear wheel rotation sensor wiring abnormal (wiring shorted or open)	ON
52		Power supply voltage abnormal (low-voltage)	ON
53		Power supply voltage abnormal (low-voltage)	ON
54		ABS solenoid valve relay supply voltage (low voltage)	ON
55		ECU trouble (ECU operation abnormal)	ON
83		Output fluid pressure sensor (front brake) trouble (voltage abnormal, wiring shorted or open)	ON

Anti-Lock Brake System

Service Code	Yellow ABS Indicator Light (LED)	Problems	Light State
84		Output fluid pressure sensor (front brake) trouble (offset abnormal)	ON
89		Power supply voltage for fluid pressure sensor abnormal (voltage abnormal, wiring shorted or open)	ON

Anti-Lock Brake System

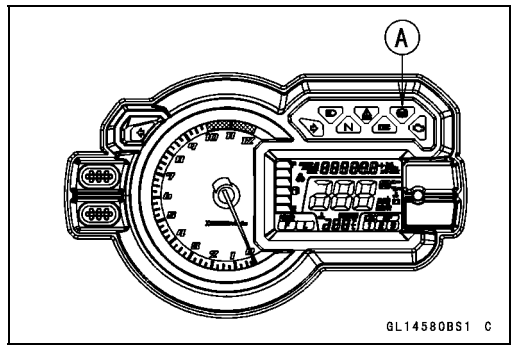
Yellow ABS Indicator Light (LED) Inspection



○In this model, the yellow ABS indicator light (LED) [A] goes on or blinks by the control of the ABS hydraulic unit.

● Refer to the meter operation Inspection in the Electrical System chapter.

Solenoid Valve Inspection (Service Code 13, 14, 17, 18)



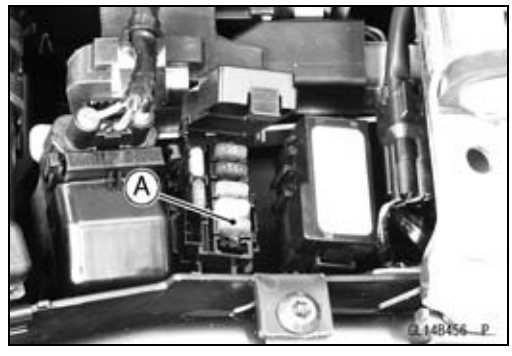
○The solenoid valve is built in the ABS Hydraulic Unit, Therefore the solenoid valve cannot be checked directly.

● Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] light, the solenoid valve in the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).

ABS Solenoid Valve Relay Inspection (Service Code 19)

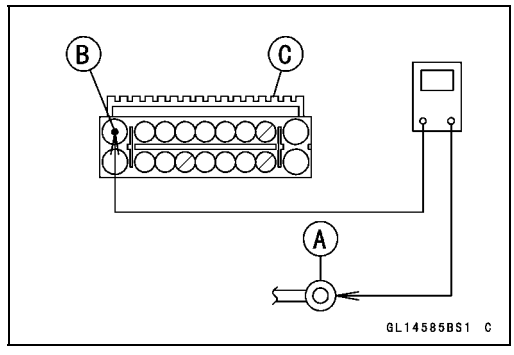


● Remove:
Seat (see Seat Removal in the Frame chapter)

● Check the ABS solenoid valve relay fuse (15 A) [A] (see Fuse Inspection in the Electrical System chapter).

★If the fuse is good, check the wiring continuity between the positive (+) terminal [A] of the battery and R/BK lead terminal [B] in the ABS Hydraulic Unit Lead Connector [C].

Special Tool - Hand Tester: 57001-1394



★If the wiring is open, replace or repair the harness (see ABS System Wiring Diagram).

★If the wiring is good, go to next step.

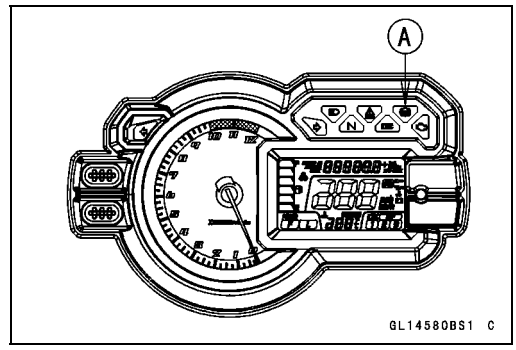
Anti-Lock Brake System

○The ABS solenoid valve relay is built in the ABS Hydraulic Unit. Therefore the relay cannot be checked directly.

● Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



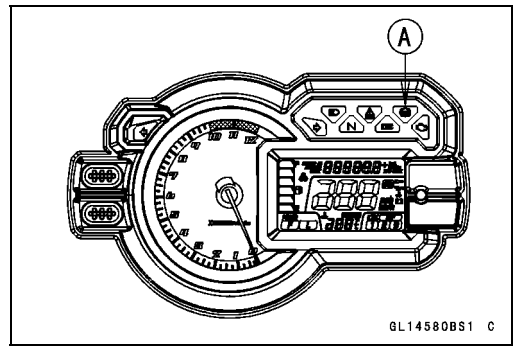
Front, Rear Wheel Rotation Difference Abnormal (Service Code 25)

● Check the following and correct the faulty part.
Incorrect Tire Pressure
Tires not recommended for the motorcycle were installed (incorrect tire size).
Deformation of Wheel or Tire
Missing Teeth and Clogging with Foreign Matter of Sensor Rotor (see Wheel Rotation Sensor Inspection)

★If the all parts correct, recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

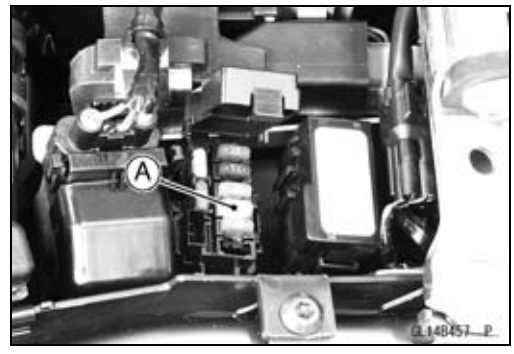
★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



ABS Motor Relay Inspection (Service Code 35)

● Remove:
Seat (see Seat Removal in the Frame chapter)

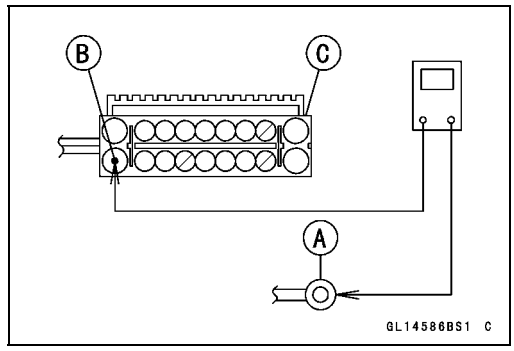
● Check the ABS motor relay fuse (25 A) [A] (see Fuse Inspection in the Electrical System chapter).



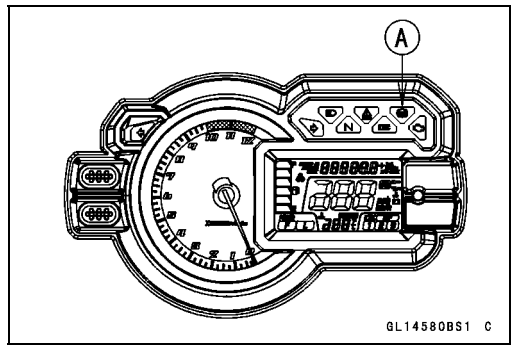
★If the fuse is good, check the wiring continuity between the positive (+) terminal [A] of the battery and R/W lead terminal [B] in the ABS hydraulic unit lead connector [C].

Special Tool - Hand Tester: 57001-1394

★If the wiring is open, replace or repair the harness (see ABS System Wiring Diagram).
★If the wiring is good, go to next step.



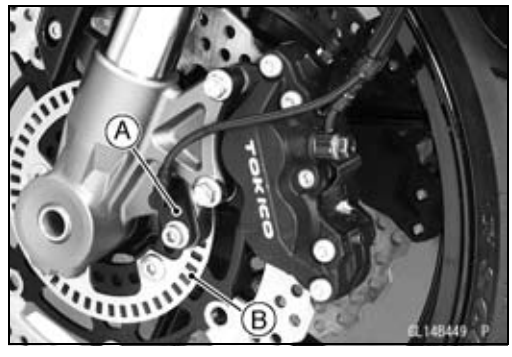
○The ABS motor relay is built in the ABS Hydraulic Unit. Therefore the relay cannot be checked directly.
● Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



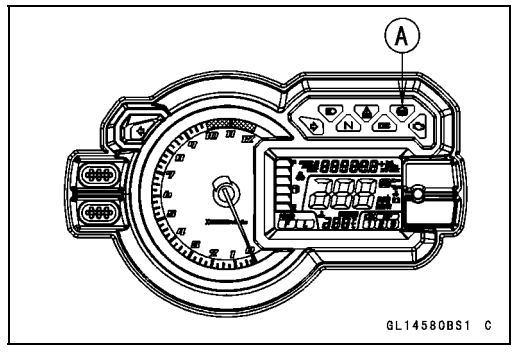
Front Wheel Rotation Sensor Signal Abnormal (Service Code 42)

● Measure the air gap between the front wheel rotation sensor and sensor rotor (see Wheel Rotation Sensor Air Gap Inspection).
● Check the front wheel rotation sensor (see Wheel Rotation Sensor Inspection).
★If both inspections are good, go to next step.

● Check that there is iron or other magnetic deposits between the sensor [A] and sensor rotor [B], and the sensor rotor slots for obstructions.
● Check the installation condition of the sensor for looseness.
● Check the sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).
★If the sensor rotor in bad condition, remove the any deposits. Install the proper part or replace faulty part.
★If the all items are good, go to next step.



● Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



Anti-Lock Brake System

Front Wheel Rotation Sensor Wiring Inspection (Service Code 43)

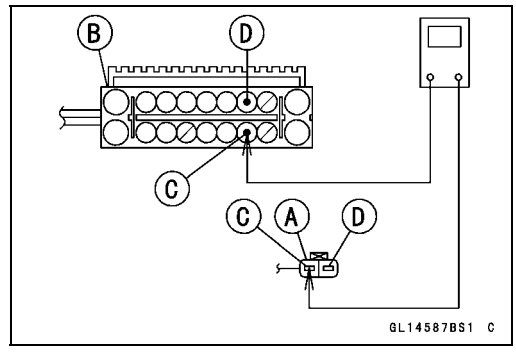
- Disconnect:
  ABS Hydraulic Unit Connector (see ABS Hydraulic Unit Removal)
  Front Wheel Rotation Sensor Connector (see Front Wheel Rotation Sensor Removal)

- Check the wiring continuity of the BK/W lead and W/BK lead.

Special Tool - Hand Tester: 57001-1394

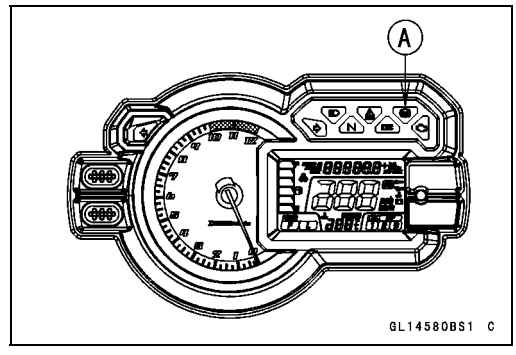
Front Wheel Rotation Sensor Lead Connector [A]
ABS Hydraulic Unit Lead Connector [B]
BK/W Lead Terminals [C]
W/BK Lead terminals [D]

★If the wiring is open, replace or repair the harness (see ABS System Wiring Diagram).
★If the wiring is good, go to next step.



- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, replace the front wheel rotation sensor (see Front Wheel Rotation Sensor Removal).
★Still, when it is not good, replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



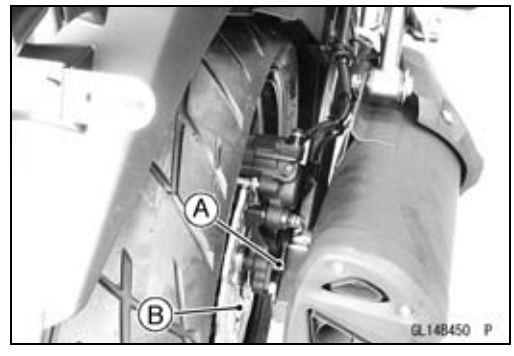
Rear Wheel Rotation Sensor Signal Abnormal (Service Code 44)

- Measure the air gap between the rear wheel rotation sensor and sensor rotor (see Wheel Rotation Sensor Air Gap Inspection).
- Check the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Inspection).

★If both inspections are good, go to next step.

- Check that there is iron or other magnetic deposits between the sensor [A] and sensor rotor [B], and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).

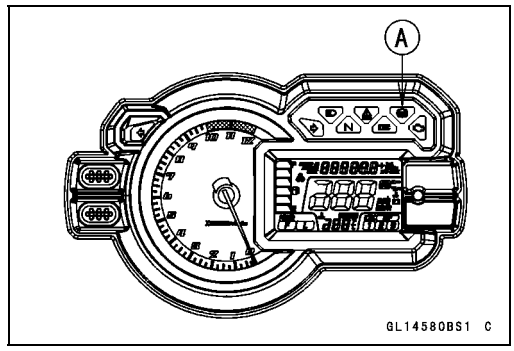
★If the sensor rotor in bad condition, remove the any deposits. Install the proper part or replace faulty part.
★If the all items are good, go to next step.



- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



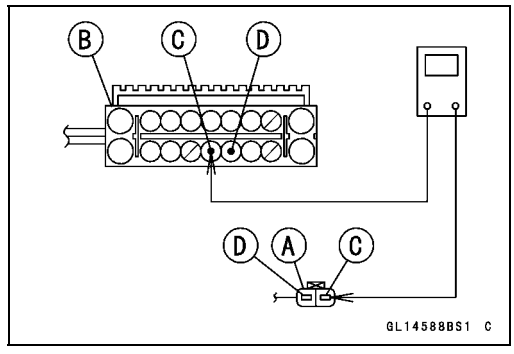
Rear Wheel Rotation Sensor Wiring Inspection (Service Code 45)

- Disconnect:
  ABS Hydraulic Unit Connector (see ABS Hydraulic Unit Removal)
  Rear Wheel Rotation Sensor Connector (see Rear Wheel Rotation Sensor Removal)

- Check the wiring continuity of the BK/O lead and W/G lead.

Special Tool - Hand Tester: 57001-1394

Rear Wheel Rotation Sensor Lead Connector [A]
ABS Hydraulic Unit Lead Connector [B]
BK/O Lead Terminals [C]
W/GK Lead terminals [D]



★If the wiring is open, replace or repair the harness (see ABS System Wiring Diagram).

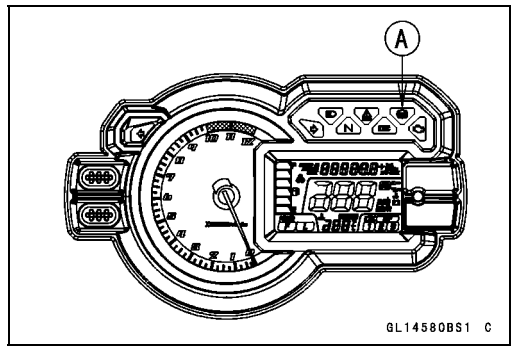
★If the wiring is good, go to next step.

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, replace the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Removal).

★Still, when it is not good, replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



Power Supply Voltage Abnormal (Low-Voltage) (Service Code 52)

- Check:
  Battery Condition (see Charging Condition Inspection in the Electrical System chapter)
  Charging Voltage (see Charging Voltage Inspection in the Electrical System chapter)

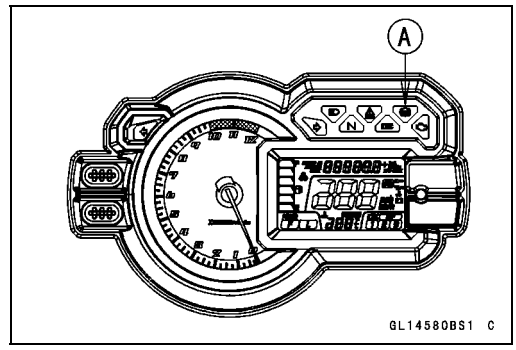
★If the battery and charging voltage are good condition, go to next step.

Anti-Lock Brake System

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



Power Supply Voltage Abnormal (Over-Voltage) (Service Code 53)

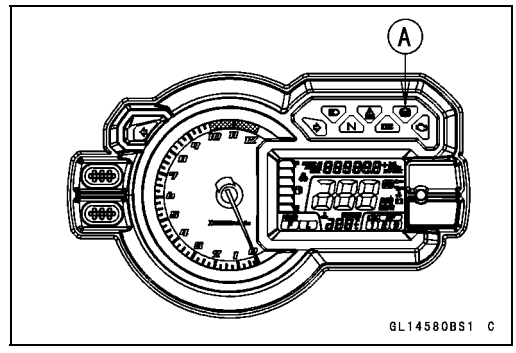
- Check the charging voltage (see Charging Voltage Inspection in the Electrical System chapter).

★If the charging voltage is good, go to next step.

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).



ABS Solenoid Valve Relay Supply Voltage Inspection (Low-Voltage) (Service Code 54)

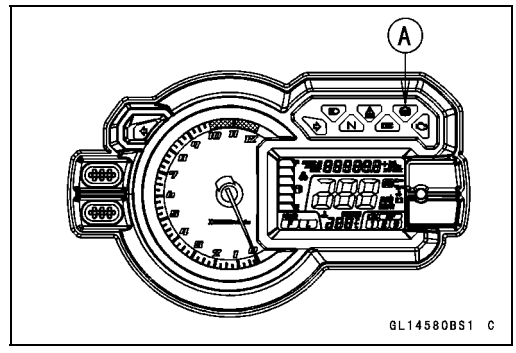
- Check the charging voltage (see Charging Voltage Inspection in the Electrical System chapter).

★If the charging voltage is good, go to next step.

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not light, ABS system is normal (service code is not stored; temporary failure.).

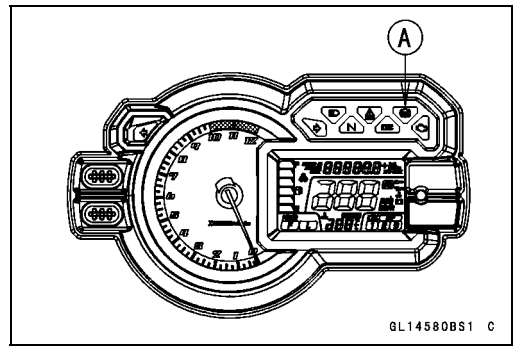


ECU Inspection (Service Code 55)

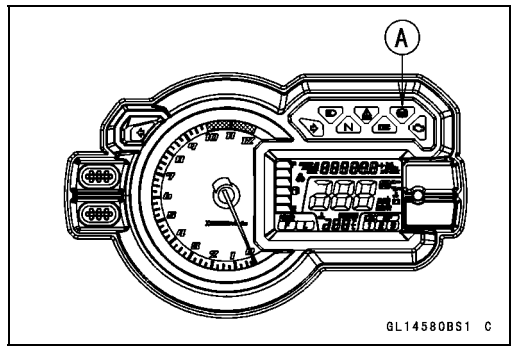
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not lgiht, ABS system is normal (service code is not stored; temporary failure.).

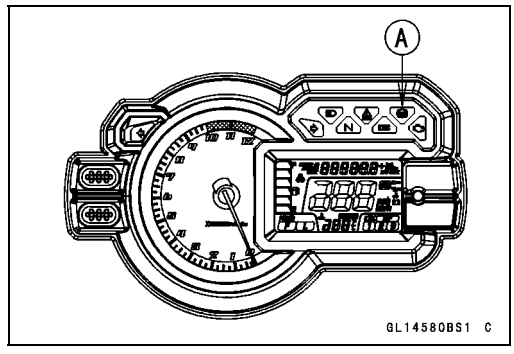


Output Fluid Pressure Sensor (Front Brake) Wiring Inspection (Service Code 83)



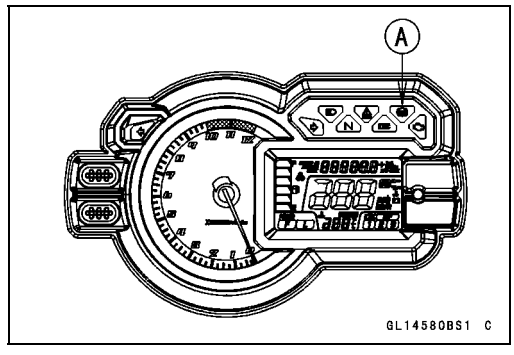
○The Output Fluid Pressure Sensor is built in the ABS Hydraulic Unit. Therefore the sensor cannot be checked directly.
● Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider).
★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not lgiht, ABS system is normal (service code is not stored; temporary failure.).

Output Fluid Pressure Sensor (Front Brake) Offset Abnormal (Service Code 84)



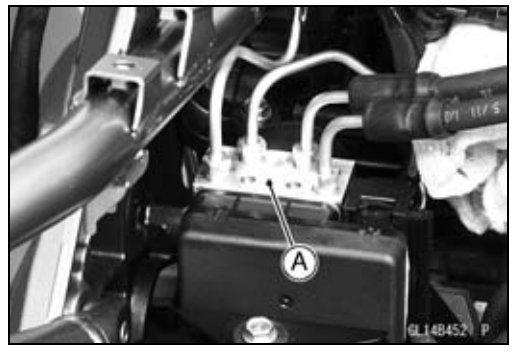
○The Output Fluid Pressure Sensor is built in the ABS Hydraulic Unit. Therefore the sensor cannot be checked directly.
● Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider).
★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not lgiht, ABS system is normal (service code is not stored; temporary failure.).

Fluid Pressure Sensor Supply Voltage Inspection (Service Code 89)



○The Fluid Pressure Sensors are built in the ABS Hydraulic Unit. Therefore the voltage cannot be checked directly.
● Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider).
★If the yellow ABS indicator light (LED) [A] lights, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not lgiht, ABS system is normal (service code is not stored; temporary failure.).

ABS Hydraulic Unit Removal



NOTICE

The ABS hydraulic unit [A] has been adjusted and set with precision at the factory. Therefore, it should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface.
Be careful not to get water or mud on the ABS hydraulic unit.

● Drain the brake fluid from the front and rear brake lines.
○Drain the brake fluid through the bleed valve by pumping the brake lever and pedal.

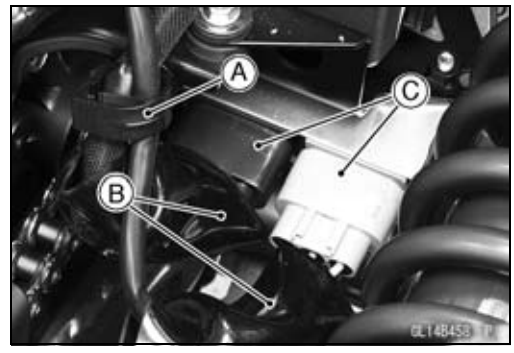
Anti-Lock Brake System

- Remove:
  Rear Fender (see Flap and Rear Fender Removal in the Frame chapter)
  Brake Hose Lower Ends (see Brake Hose Replacement in the Periodic maintenance chapter)
- Clean the ABS hydraulic unit.

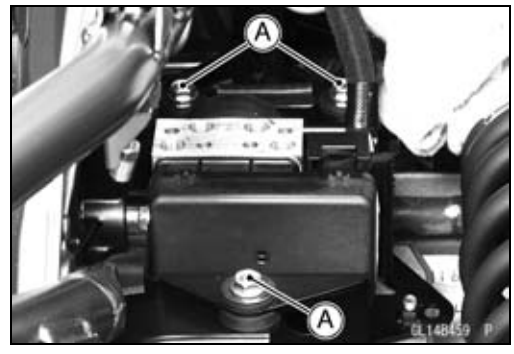
NOTICE

Clean all fittings on the ABS hydraulic unit and the rear master cylinder because dirt around the banjo bolts could contaminate the brake fluid in the line during removal/installation.
Spread over a shop towel around the ABS hydraulic unit before removing the brake line so that brake fluid does not leak on the parts.

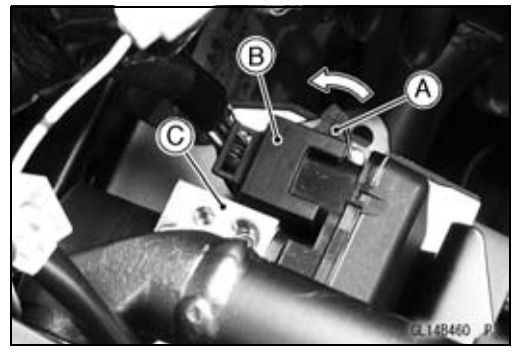
- Open the clamp [A].
- Slide the covers [B] to disconnect the regulator/rectifier connectors [C].



- Remove the bolts [A].

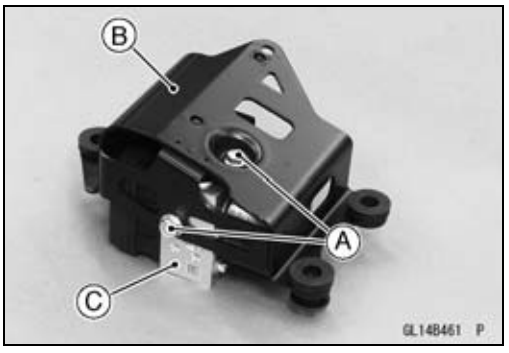


- Pull the lever [A] forward to disconnect the ABS hydraulic unit connector [B].
- Pull up the ABS hydraulic unit [C].



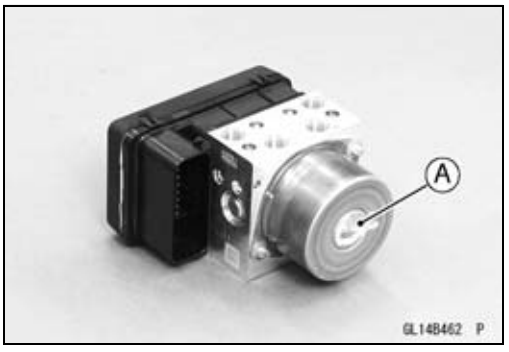
Anti-Lock Brake System

- Remove:
  Regulator/Rectifier (see Regulator/Rectifier Removal in the Electrical System chapter)
  Bolts [A]
  Bracket [B]
  ABS Hydraulic Unit [C]



NOTICE

The ABS hydraulic unit [A] has been adjusted and set with precision at the factory. Do not try to disassemble and repair the ABS hydraulic unit.



ABS Hydraulic Unit Installation

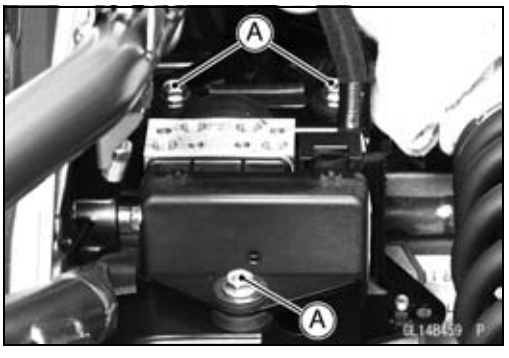
- Install the ABS hydraulic unit to the bracket.

NOTICE

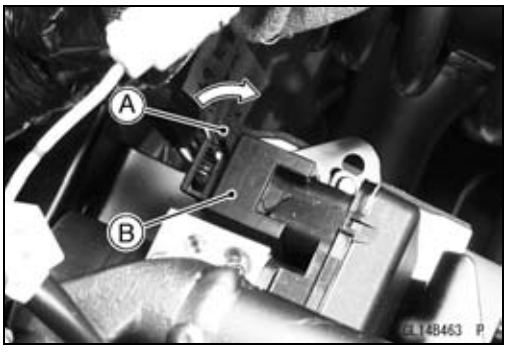
Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.

- Apply a non-permanent locking agent to the thread of the bolts [A], and tighten them.
- Tighten:

Torque - ABS Hydraulic Unit Bracket Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Pull the lever [A] backward to connect the ABS hydraulic unit connector [B].
- Install the brake hoses correctly (see Brake Hose Replacement in the Periodic Maintenance chapter).
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.
- Install the removed parts (see appropriate chapters).



ABS Hydraulic Unit Inspection

- Remove the ABS hydraulic unit (see ABS Hydraulic Unit Removal).
- Visually inspect the ABS hydraulic unit.

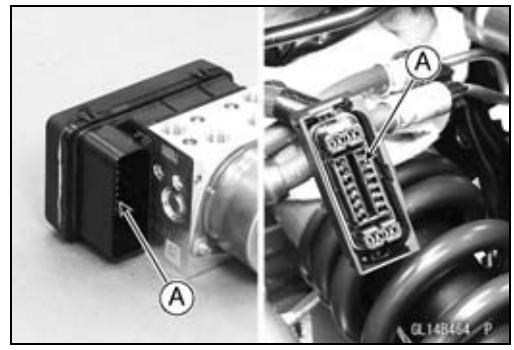
★Replace the ABS hydraulic unit if any of them are cracked, or otherwise damaged.

Anti-Lock Brake System

- Visually inspect the connector terminals [A].

★Replace the ABS hydraulic unit or main harness if either of the terminals are cracked, bent, or otherwise damaged.

★If the ABS hydraulic unit connector is clogged with mud or dust, blow it off with compressed air.

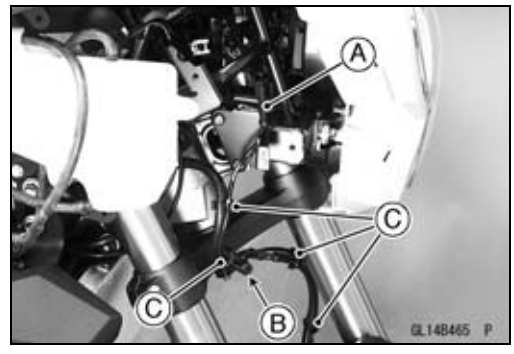


Front Wheel Rotation Sensor Removal

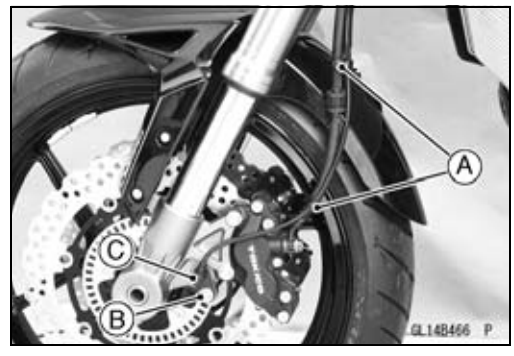
NOTICE

The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor.
Do not try to disassemble or repair the wheel rotation sensor.

- Remove:
  Right Upper Side Fairing (see Upper Side Fairing Removal in the Frame chapter)
  Connector [A] (Disconnect)
  Grommet [B]
- Clear the sensor lead from the clamps [C].



- Clear the sensor lead from the clamps [A].
- Remove:
  Bolt [B]
  Front Wheel Rotation Sensor [C]



Front Wheel Rotation Sensor Installation

- Installation is the reverse of removal, note the following.

○Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

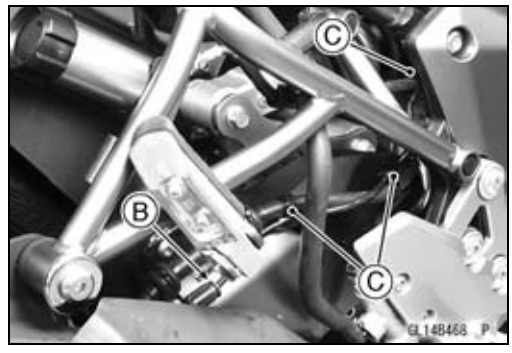
Anti-Lock Brake System

Rear Wheel Rotation Sensor Removal

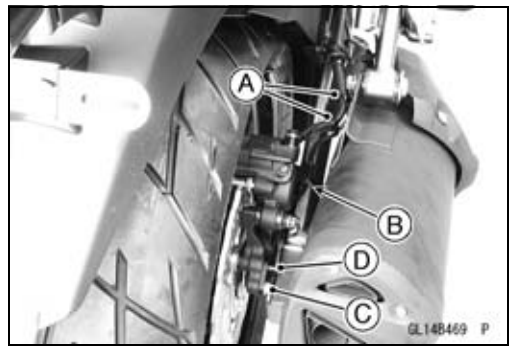
NOTICE

The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor.
Do not try to disassemble or repair the wheel rotation sensor.

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Connector [A] (Disconnect)
  Grommet [B]
- Clear the sensor lead from the clamps [C].



- Clear the sensor lead from the clamps [A].
- Remove:
  Grommet [B]
  Bolt [C]
  Rear Wheel Rotation Sensor [D]



Rear Wheel Rotation Sensor Installation

- Installation is the reverse of removal, note following.

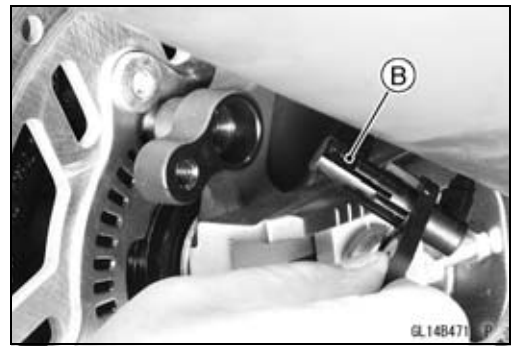
○Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Anti-Lock Brake System

Wheel Rotation Sensor Inspection

- Remove the front wheel rotation sensor [A] from the front fork.
- Remove the rear wheel rotation sensor [B] from the caliper bracket.
- Visually inspect the wheel rotation sensors.

★Replace the wheel rotation sensor if it is cracked, bent, or otherwise damaged.



Wheel Rotation Sensor Air Gap Inspection

- Raise the front/rear wheel off the ground (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Measure the air gap between the sensor and sensor rotor at several points by turning the wheel slowly.
  Thickness Gauge [A]

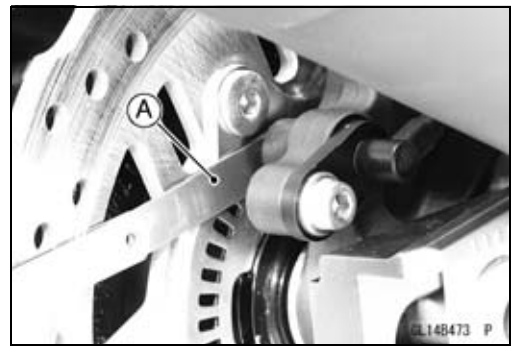
Air Gap
Standard:

Front	**0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)**
Rear	**0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)**

NOTE

○*The sensor air gap cannot be adjusted.*

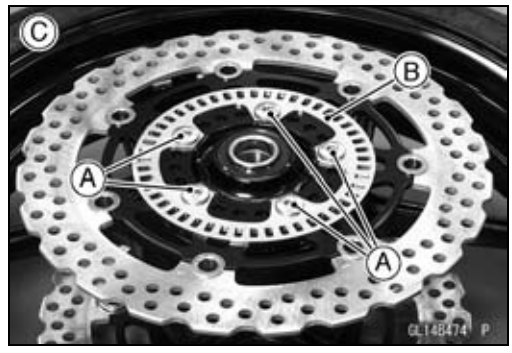
★If the air gap is not within the specification, inspect the hub bearing (see Hub Bearing Inspection in the Wheels/Tires chapter), sensor installation condition and sensor (see Wheel Rotation Sensor Inspection).

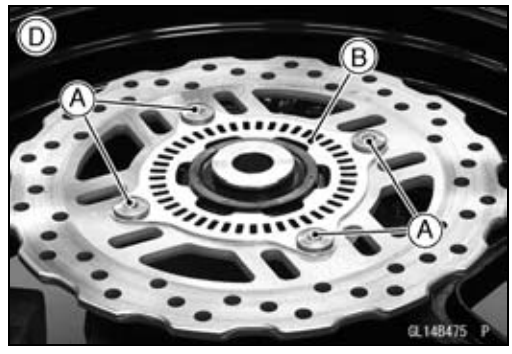


Anti-Lock Brake System

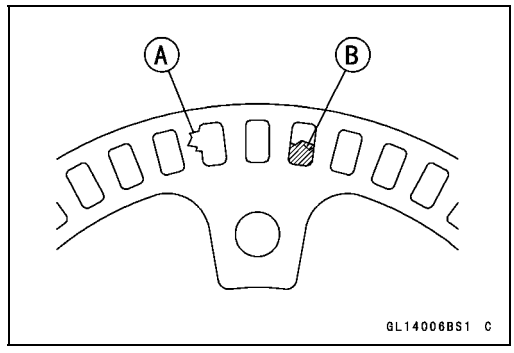
Wheel Rotation Sensor Rotor Inspection

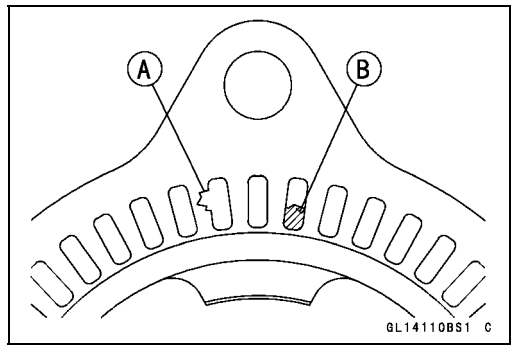
- Remove:
  Wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter)
  Brake Disc Mounting Bolts [A]
  Sensor Rotor [B]
  Front Wheel [C]
  Rear Wheel [D]





- Visually inspect the wheel rotation sensor rotor.
★If the rotor is deformed or damaged (chipped teeth [A]), replace the sensor rotor with a new one.
★If there is iron or other magnetic deposits [B], remove the deposits.





ABS Solenoid Valve Relay Fuse (15 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

ABS Motor Relay Fuse (25 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

Fuse Installation

- If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage (see Fuse Installation in the Electrical System chapter).

Anti-Lock Brake System

Fuse Inspection

- Remove the fuses (see ABS Solenoid Valve Relay Fuse (15 A)/ABS Motor Relay Fuse (25 A) Removal).
- Refer to the Fuse Inspection in the Electrical System chapter.

Suspension

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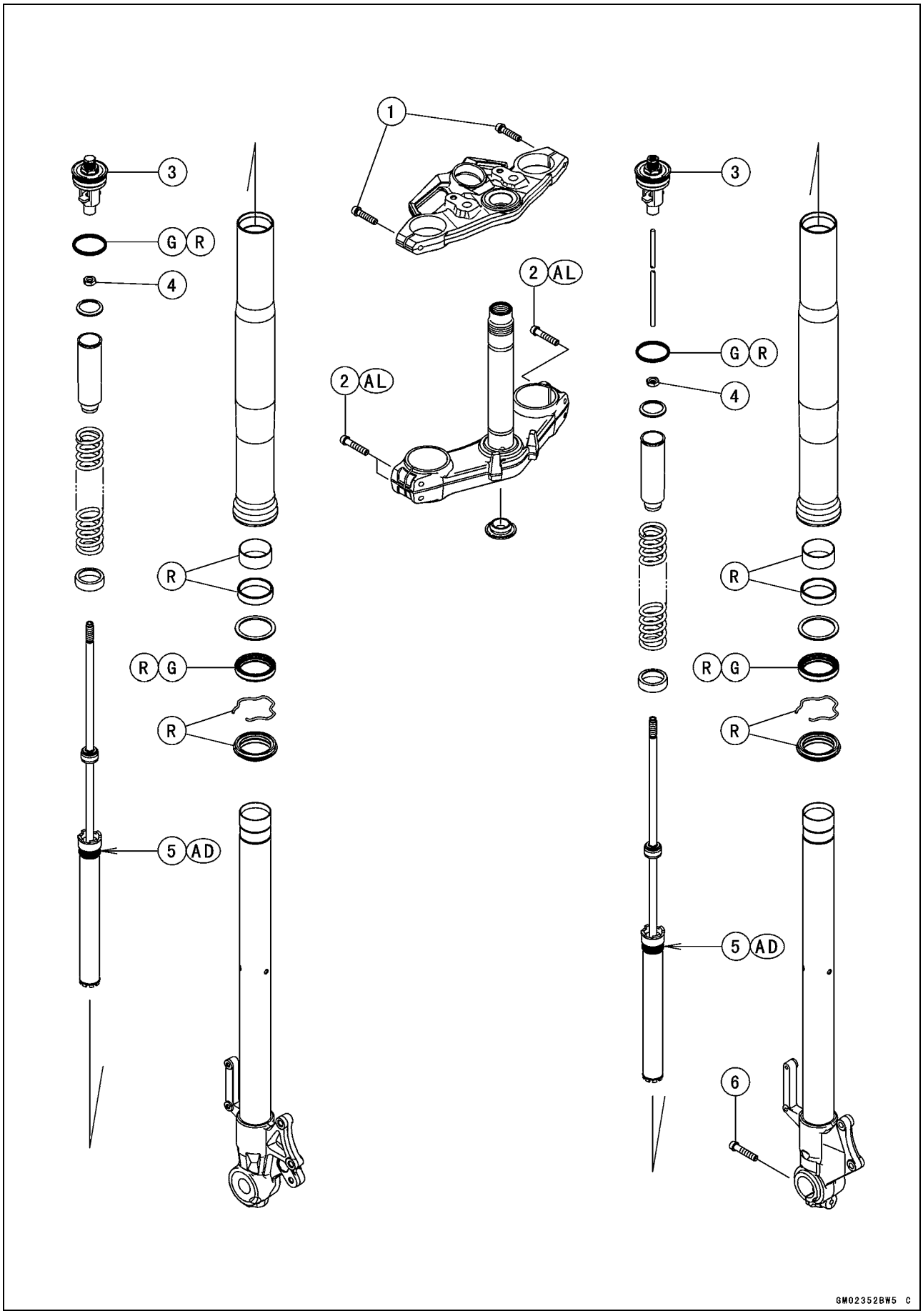
Exploded View

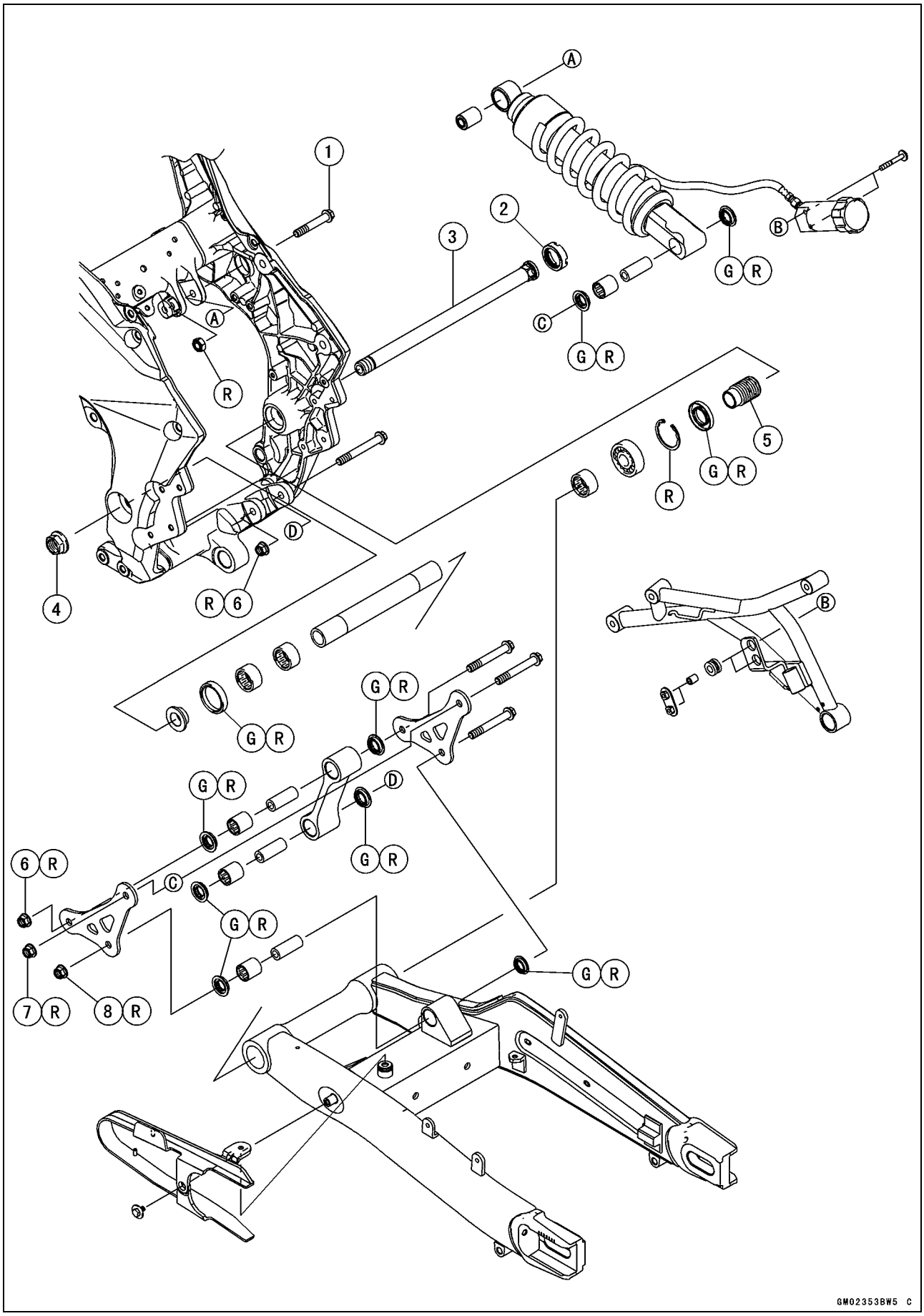


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Upper Front Fork Clamp Bolts	20	2.0	15	
2	Lower Front Fork Clamp Bolts	20.5	2.09	15.1	AL
3	Front Fork Top Plugs	22.5	2.29	16.6	
4	Piston Rod Nuts	15	1.5	11	
5	Cylinder Units	60	6.1	44	AD
6	Front Axle Clump Bolt	20	2.0	15	

AD: Apply adhesive (ThreeBond: TB1344N or equivalent).
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
R: Replacement Parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Shock Absorber Bolt (Upper)	34	3.5	25	
2	Swingarm Pivot Adjusting Collar Locknut	98	10	72	
3	Swingarm Pivot Shaft	20	2.0	15	
4	Swingarm Pivot Shaft Nut	108	11.0	79.7	
5	Swingarm Pivot Adjusting Collar	20	2.0	15	
6	Tie-rod Nuts	34	3.5	25	R
7	Rear Shock Absorber Nut (Lower)	34	3.5	25	R
8	Rocker Arm Nut	34	3.5	25	R

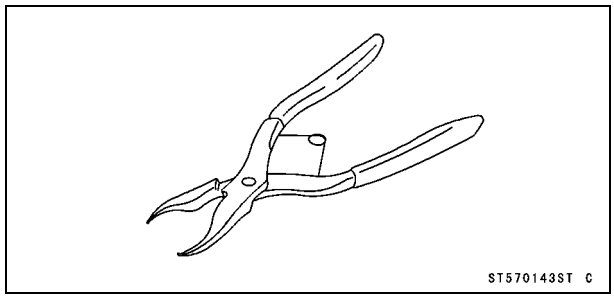
G: Apply grease.
R: Replacement Parts

Specifications

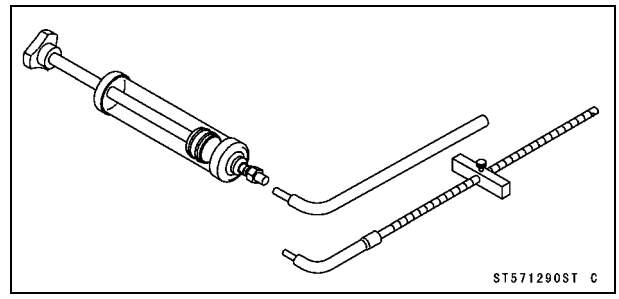
Item	Standard
Front Fork (Per One Unit)	
Fork Inner Tube Diameter	ϕ43 mm (1.7 in.)
Air Pressure	Atmospheric pressure (non-adjustable)
Rebound Damper Setting (Right Front Fork Only)	7 clicks from the fully clockwise position (Usable range: 0 ←→ 12 clicks)
Fork Spring Preload Setting	Adjuster protrusion is 12 mm (0.47 in.) (Usable range: 4 ~ 19 mm, 0.16 ~ 0.75 in.)
Fork Oil:	
Recommend Oil	KHL15-10 or equivalent
Amount:	
When Changing Oil (for reference)	
Right Front Fork	Approx. 450 mL (15.2 US oz.)
Left Front Fork	Approx. 455 mL (15.4 US oz.)
After Disassembly and Completely Dry	
Right Front Fork	528 ±4 mL (17.9 ±0.1 US oz.)
Left Front Fork	535 ±4 mL (18.1 ±0.1 US oz.)
Fork Oil Level: (Fully Compressed, without Spring, below from the Top of the Outer Tube)	
Right Front Fork	115 ±2 mm (4.53 ±0.08 in.)
Left Front Fork	114 ±2 mm (4.49 ±0.08 in.)
Fork Spring Free Length	282 mm (11.1 in.) (Service Limit: 276 mm (10.9 in.))
Rear Shock Absorber	
Rebound Damper Setting	2 turns out from the fully clockwise position (Usable Range: 0 ←→ 3 3/4 turns out)
Spring Preload Setting Position	1 click from the fully counterclockwise position (Usable Range: 0 ←→ 24 clicks)
Gas Pressure	1 270 kPa (13 kgf/cm², 184 psi, Non-adjustable)

Special Tools

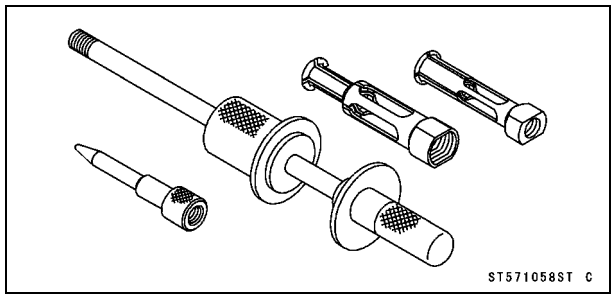
Inside Circlip Pliers:
57001-143



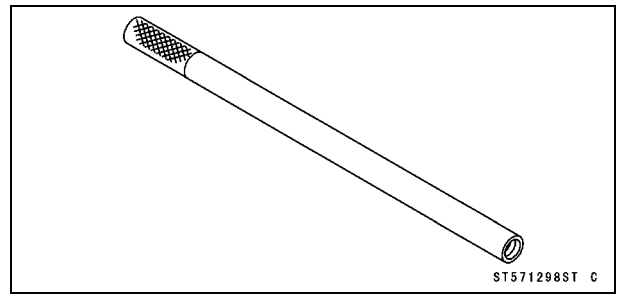
Fork Oil Level Gauge:
57001-1290



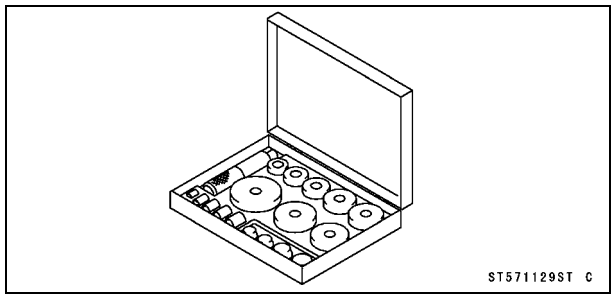
Oil Seal & Bearing Remover:
57001-1058



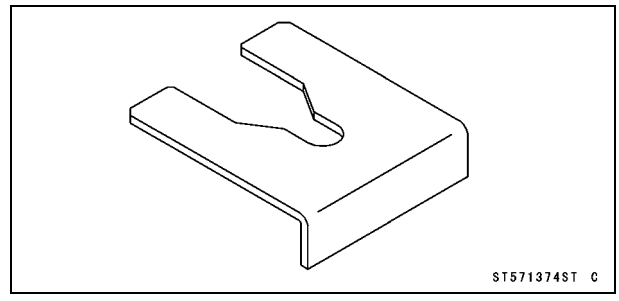
Fork Piston Rod Puller, M10 × 1.0:
57001-1298



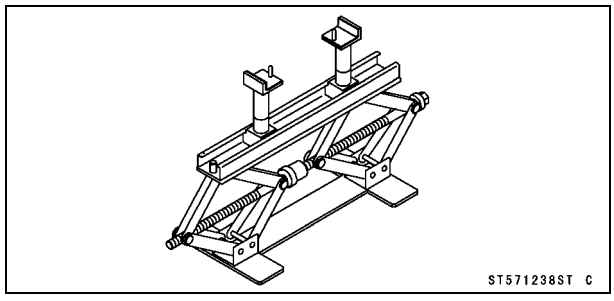
Bearing Driver Set:
57001-1129



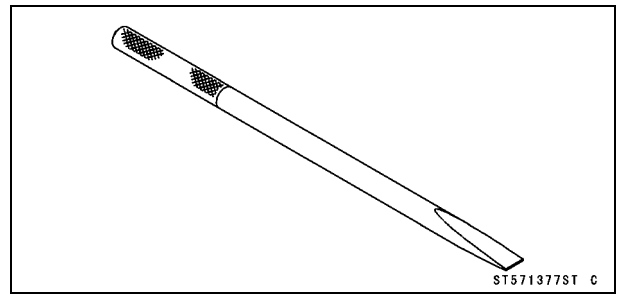
Fork Spring Stopper:
57001-1374



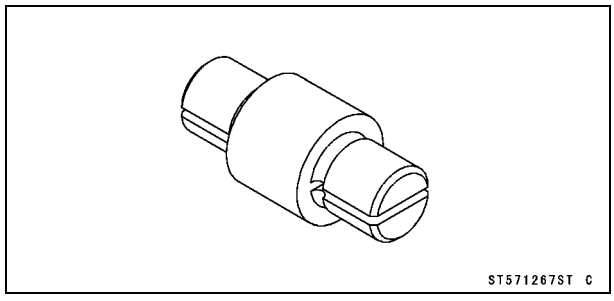
Jack:
57001-1238



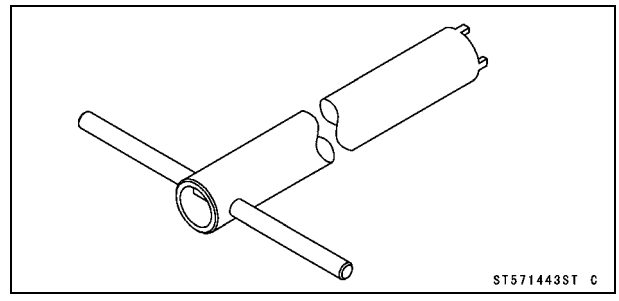
Bearing Remover Shaft, ϕ13:
57001-1377



Bearing Remover Head, ϕ15 × ϕ17:
57001-1267

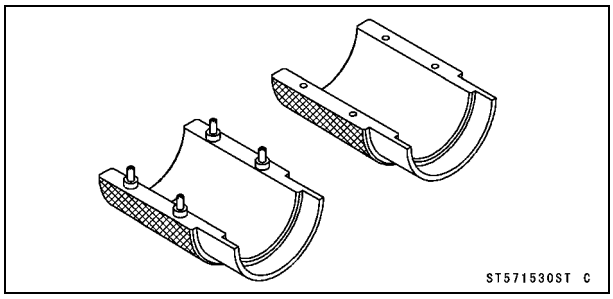


Fork Cylinder Holder:
57001-1443

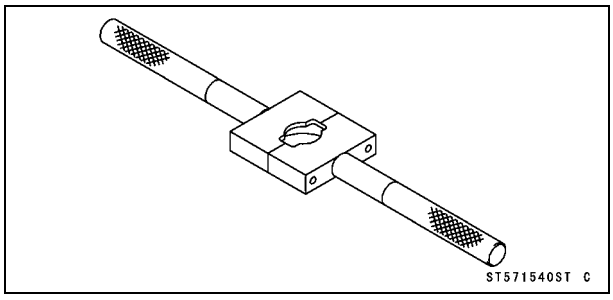


Special Tools

Fork Oil Seal Driver, ϕ43:
57001-1530



Fork Spring Compressor:
57001-1540



Fork Spring Compressor:
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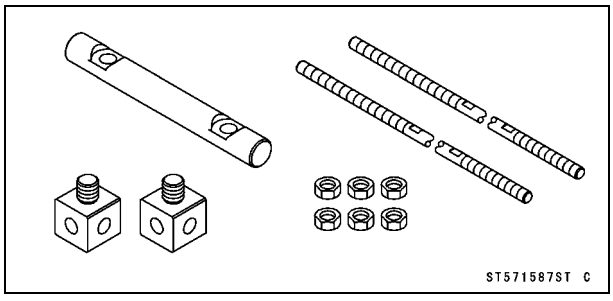
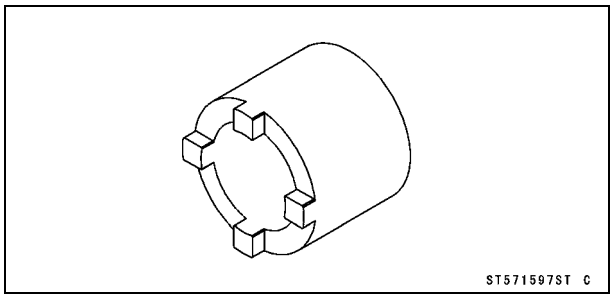
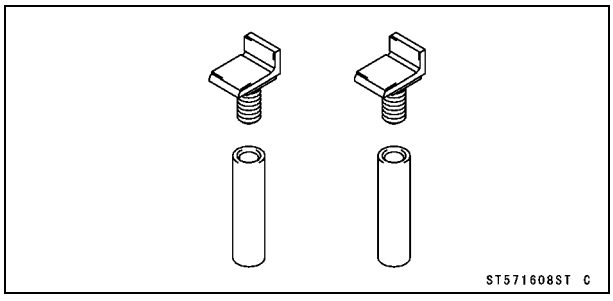


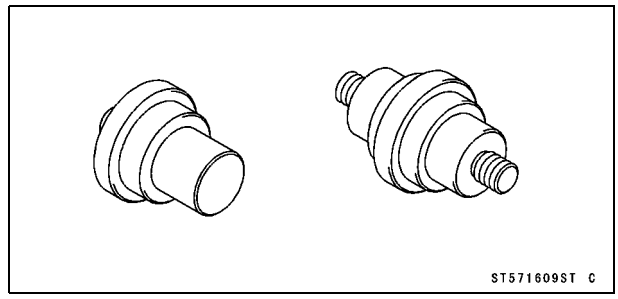
Swingarm Pivot Nut Wrench:
57001-1597



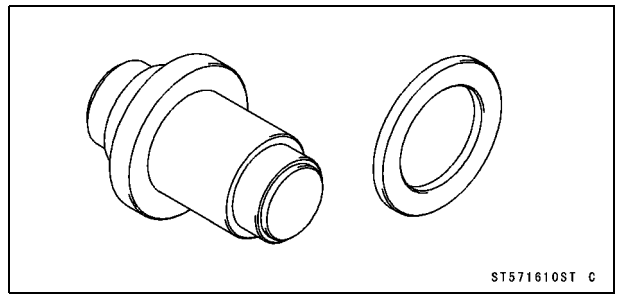
Jack Attachment:
57001-1608



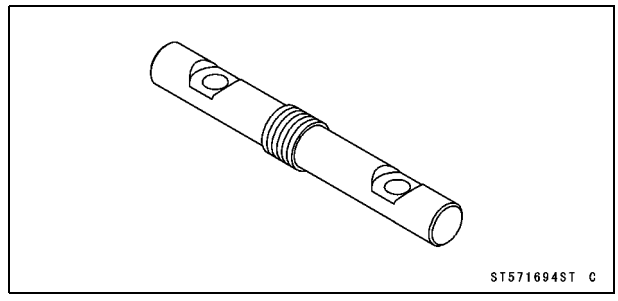
Needle Bearing Driver, ϕ17/ϕ18:
57001-1609



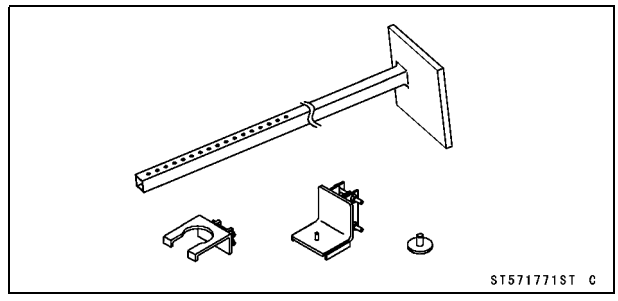
Needle Bearing Driver, ϕ28:
57001-1610



Bar:
57001-1694



Fork Spring Compressor:
57001-1771

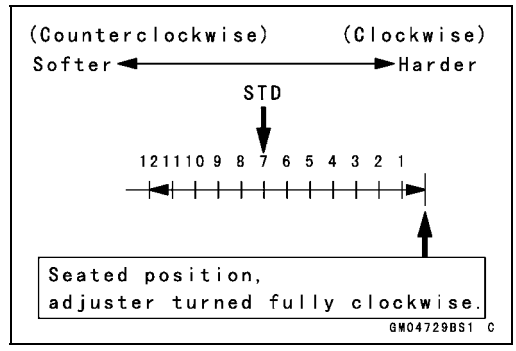


Front Fork

Rebound Damping Force Adjustment (Right Front Fork Only)

- To adjust the rebound damping force, turn the rebound damping adjuster [A] until you feel a click.

○The standard adjuster setting is the **7 clicks** from the fully clockwise position.

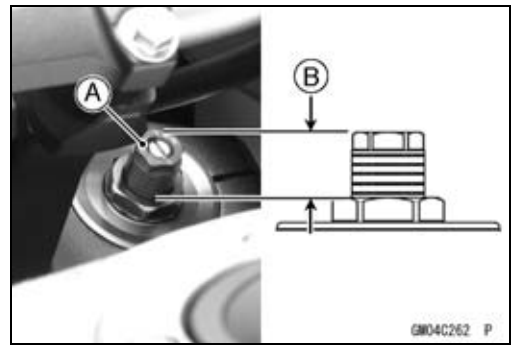


○The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
12 clicks	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High

Spring Preload Adjustment



- Turn the spring preload adjuster [A] to change spring preload setting.

○The standard adjuster setting is the 12 mm (0.47 in.) [B] from top as shown in the figure.

Adjuster Protrusion (from top)
Standard: 12 mm (0.47 in.)
Usable Range: 4 ~ 19 mm (0.16 ~ 0.75 in.)

⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result. Be sure the adjusters are set equally.

○The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

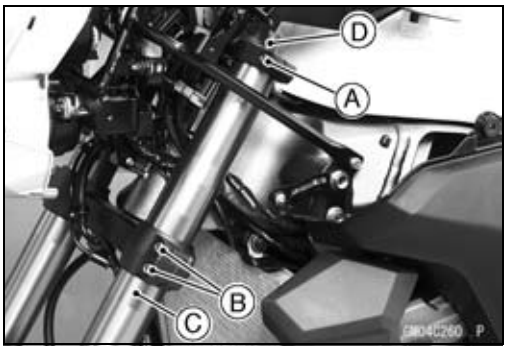
Spring Action

Adjuster Position	Damping Force	Setting	Load	Road	Speed
19 mm	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
4 mm	Strong	Hard	Heavy	Bad	High

Front Fork

Front Fork Removal (Each Fork Leg)

● Remove:
Upper Side Fairing (see Upper Side Fairing Removal in the Frame chapter)
Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)



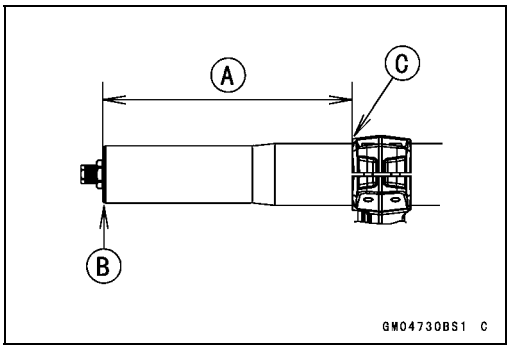
● Loosen the upper front fork clamp bolt [A] and lower front fork clamp bolts [B].
○If fork leg [C] is to be disassembled, loosen the upper front fork clamp bolt. Then, loosen the top plug [D] beforehand.

NOTE

○*Loosen the top plug after loosening the upper front fork clamp bolt.*

○Loosen the lower front fork clamp bolts.
● With a twisting motion, work the fork leg down and out.

Front Fork Installation



● Install the fork so that the length [A] is 218 mm (8.58 in.) from the top end [B] of the outer tube to upper surface [C] of the lower front fork clamp.
218 mm (8.58 in.) [A]
● Tighten:

Torque - Lower Front Fork Clamp Bolts : 20.5 N·m (2.09 kgf·m, 15.1 ft·lb)
Front Fork Top Plugs: 22.5 N·m (2.29 kgf·m, 16.6 ft·lb)
Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

NOTE

○*Tighten the top plug before tightening the upper front fork clamp bolt.*
○*Tighten the two clamp bolts (lower) alternately two times to ensure even tightening torque.*

● Install the removed parts (see appropriate chapters).
● Adjust:
Spring Preload (see Spring Preload Adjustment)
Rebound Damping Force (see Rebound Damping Force Adjustment)

Fork Oil Change

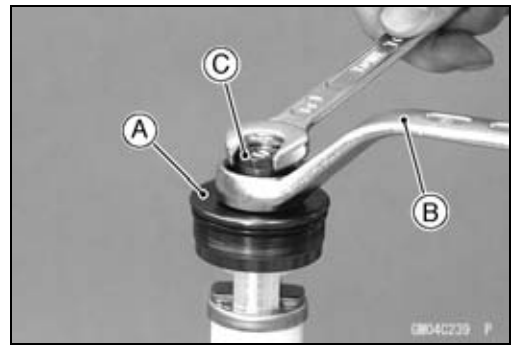
● Remove the front fork (see Front Fork Removal).
● Hold the inner tube lower end in a vice.
● Unscrew the top plug [A] out of the outer tube.

Front Fork

● Holding the top plug [A] with a wrench [B], tighten the spring preload adjuster [C].

NOTE

○*After tightening, lift the top plug to make the space.*

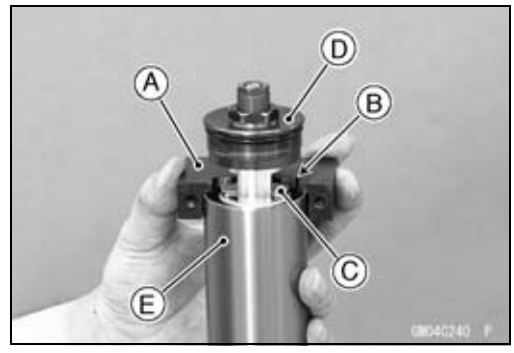


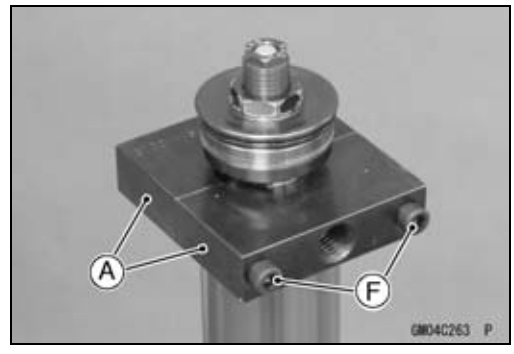
● Install the clamps [A] as shown in the figure.

NOTE

○*Set the cutout [B] of the clamp to the plate [C] of top plug [D], pull up the outer tube [E] to hold it by the clamps, and then tighten the two bolts [F]. The outer tube is used as a guide.*

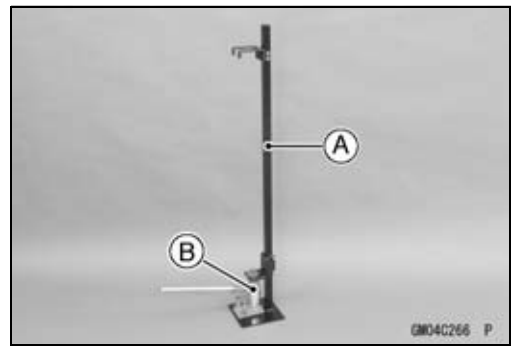
Special Tool - Fork Spring Compressor: 57001-1540



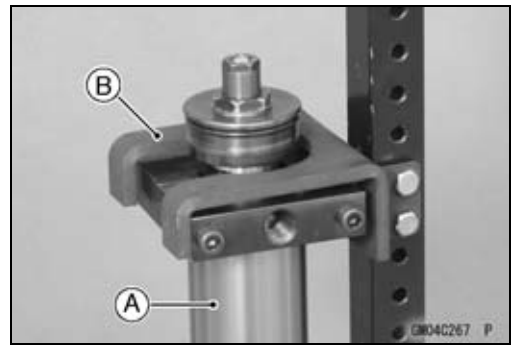


● Set the spring compressor [A] and suitable jack [B] as shown in the figure.

Special Tool - Fork Spring Compressor: 57001-1771



● Set the front fork [A] under the holder [B].

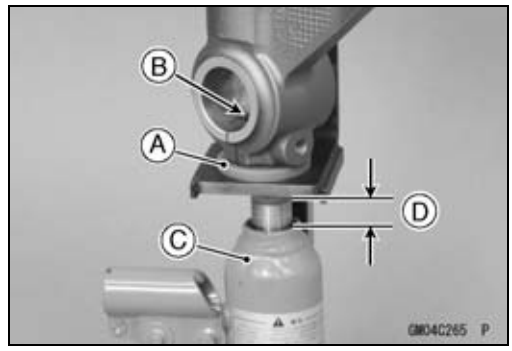


Front Fork

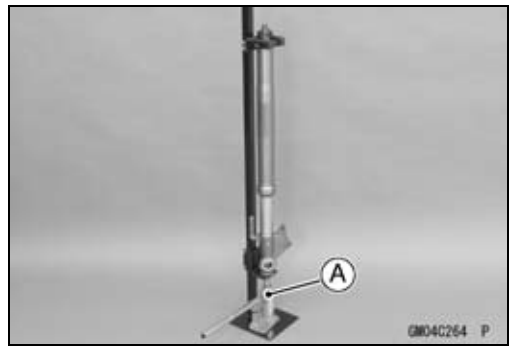
- Insert the projection of the protector [A] into the front fork bottom hall [B].

○For right front fork, remove the front axle clamp bolt.

- Lift up the suitable jack [C] about 20 mm (0.79 in.) [D].

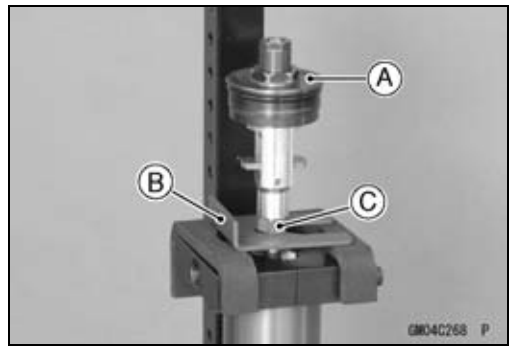


- Lift up the suitable jack [A] until the piston rod nut comes out.

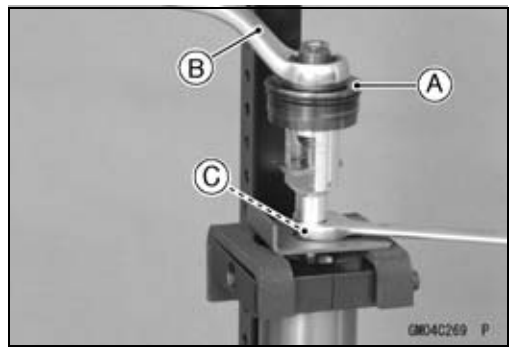


- While holding the top plug [A], insert the fork spring stopper [B] between the piston rod nut [C] and the slider.

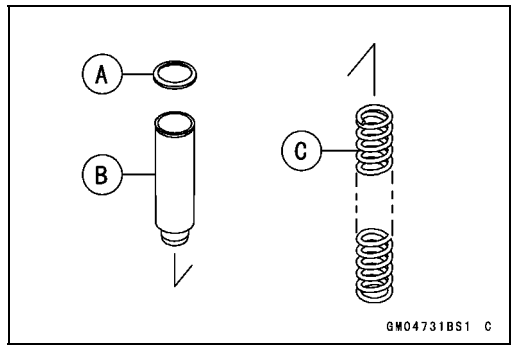
Special Tool - Fork Spring Stopper: 57001-1374



- Holding the top plug [A] with a wrench [B], loosen the piston rod nut [C].



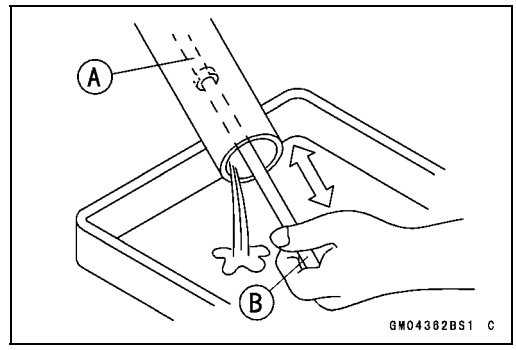
- Remove:
  Top Plug
  Rebound Damping Adjuster Rod (Right Front Fork Only)
  Washer [A]
  Collar [B]
  Fork Spring [C]



Front Fork

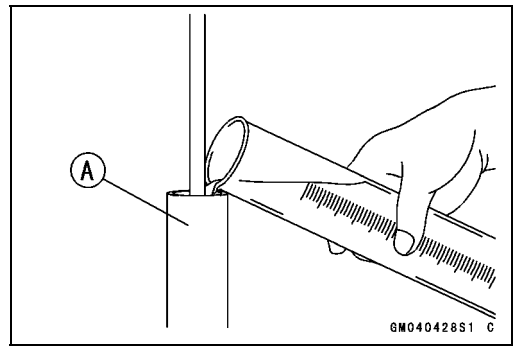
● Drain the fork oil into a suitable container and remove the spring seat.
○Pump the piston rod [A] up and down at least ten times to expel the oil from the fork.

Special Tool - Fork Piston Rod Puller, M10 × 1.0 [B]: 57001 -1298



● Hold the fork tube upright, press the outer tube [A] and the piston rod all the way down.
● Pour in the type and amount of fork oil specified.

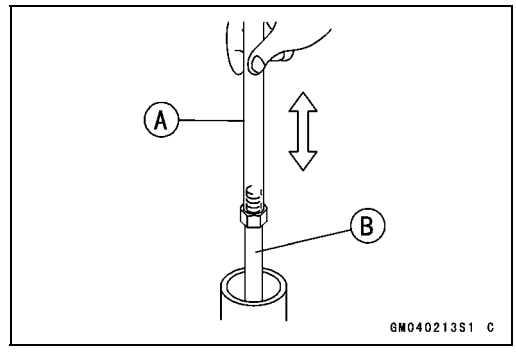
Fork Oil
Recommended Oli:
KHL15-10 or equivalent
Amount (Per Side):
When changing oil (for reference):
Right Front Fork Approx. 450 mL (15.2 US oz.)
Left Front Fork Approx. 455 mL (15.4 US oz.)
After disassembly and completely dry:
Right Front Fork 528 ±4 mL (17.9 ±0.1 US oz.)
Left Front Fork 535 ±4 mL (18.1 ±0.1 US oz.)



★Measure the oil level as follows.
○Hold the inner tube vertically in a vise.
○Using the piston rod puller [A], move the piston rod [B] up and down more than ten times in order to expel all the air from the fork oil.

Special Tool - Fork Piston Rod Puller, M10 × 1.0 [A]: 57001 -1298

○Remove the piston rod puller.
○Wait until the oil level settles.
○With the fork fully compressed and the piston rod fully pushed in, insert a tape measure or rod into the inner tube, and measure the distance from the top of the outer tube to the oil.



Front Fork

Oil Level (fully compressed, without spring)
Standard:

Right Front Fork 115 ±2 mm (4.53 ±0.08 in.) (from the top of the outer tube)

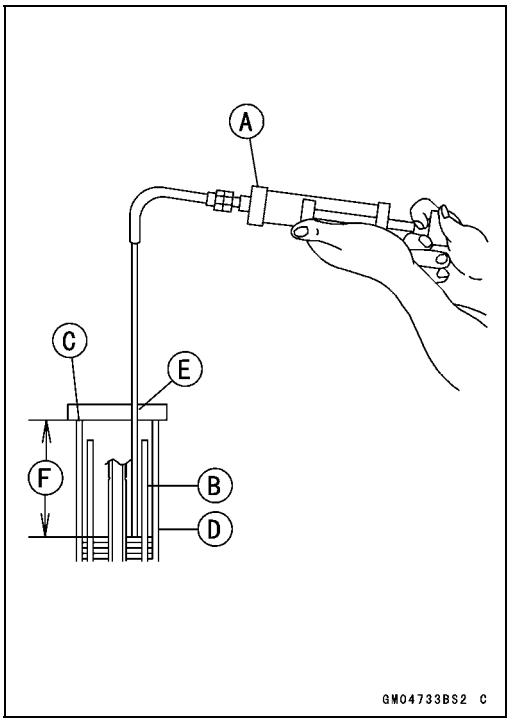
Left Front Fork 114 ±2 mm (4.49 ±0.08 in.) (from the top of the outer tube)

NOTE

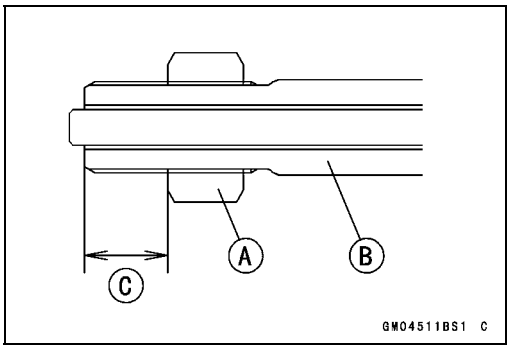
○*Fork oil level may also be measured using the fork oil level gauge.*

Special Tool - Fork Oil Level Gauge [A]: 57001-1290

○With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [B] and position the stopper across the top end [C] of the outer tube [D].
○Set the gauge stopper [E] so that its lower side shows the oil level distance specified [F].
○Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
★If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



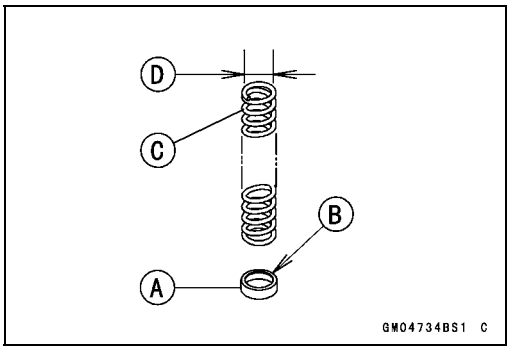
● Screw the rod nut [A] onto the piston rod [B] as shown in the figure.
15 mm (0.59 in.) or more [C]



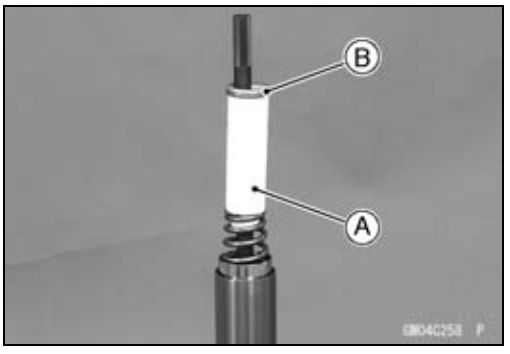
● Screw the fork piston rod puller onto the end of the piston rod.

Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298

● Install the spring seat [A] with the flat surface [B] facing upward.
● Install the fork spring [C] with the smaller end [D] facing upward.

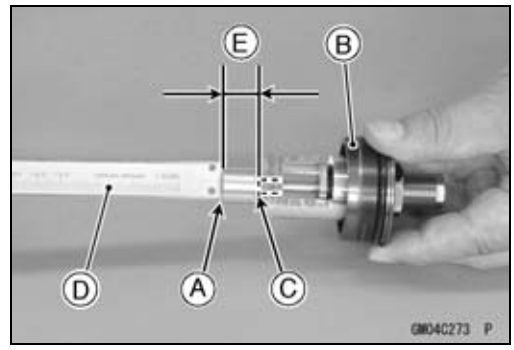


● Install:
Collar [A]
Washer [B]



Front Fork

- Check the distance between the lower end [A] of the top plug [B] and lower end [C] of the rebound damping adjuster with a vernier caliper [D] (Right Front Fork Only).
  14.5 mm (0.571 in.) or more [E]

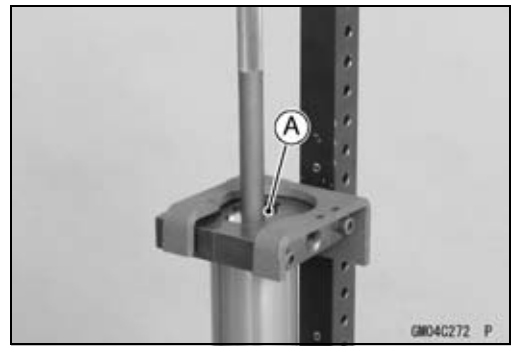


- Set the fork spring compressor on the washer [A] using the outer tube as a guide.

Special Tools - Fork Spring Compressor: 57001-1771
Fork Spring Compressor: 57001-1540

NOTE

○*Set the cutout of the clamp to the slider.*



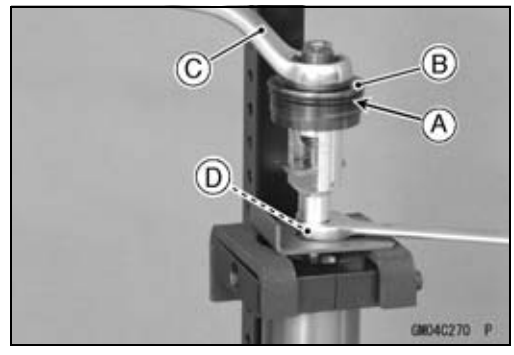
- While holding up the piston rod puller, insert the fork spring stopper between the piston rod nut and the slider.

Special Tool - Fork Spring Stopper: 57001-1374

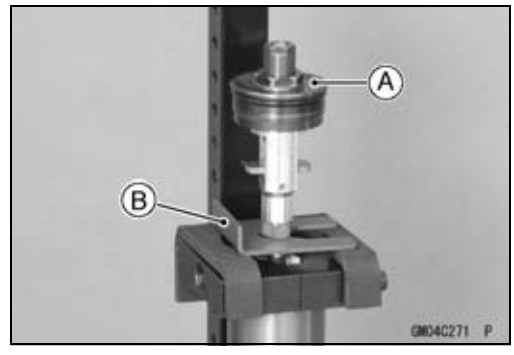
- Remove the piston rod puller.
- Insert the rebound damping adjuster rod into the holes of the piston rod (Right Front Fork Only).

- Replace the O-ring [A] on the top plug with a new one.
- Apply grease to the new O-ring.
- Screw in the top plug until it stops onto the piston rod.
- Holding the top plug [B] with a wrench [C], tighten the piston rod nut [D] against the top plug.

Torque - Piston Rod Nuts: 15 N·m (1.5 kgf·m, 11 ft·lb)



- While holding up the top plug [A], pull out the fork spring stopper [B].
- Remove the fork spring compressor.
- Raise the outer tube and screw the top plug into it.
- Install the front fork (see Front Fork Installation).
- Adjust the spring preload (see Spring Preload Adjustment).
- Adjust the rebound damping force (see Rebound Damping Force Adjustment, Right Front Fork Only)



Front Fork

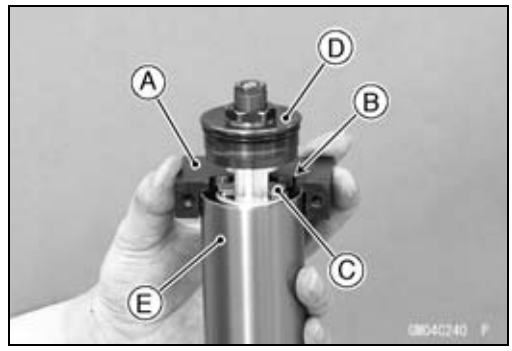
If using the spring compressor (57001-1587)

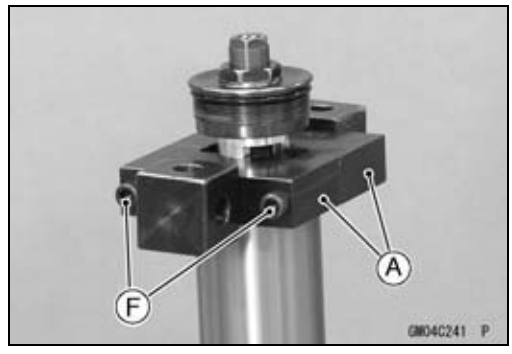
● Install the clamps [A] as shown in the figure.

NOTE

○*Set the cutout [B] of the clamp to the plate [C] of top plug [D], pull up the outer tube [E] to hold it by the clamps, and then tighten the two bolts [F]. The outer tube is used as a guide.*

Special Tools - Fork Spring Compressor: 57001-1587
Fork Spring Compressor: 57001-1540

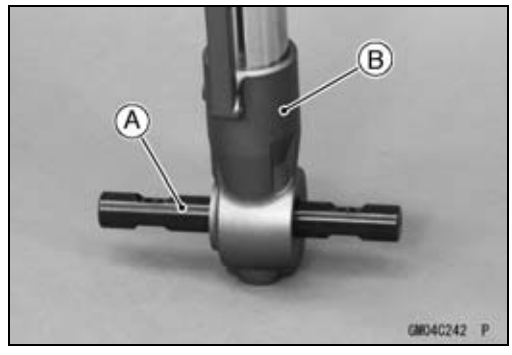




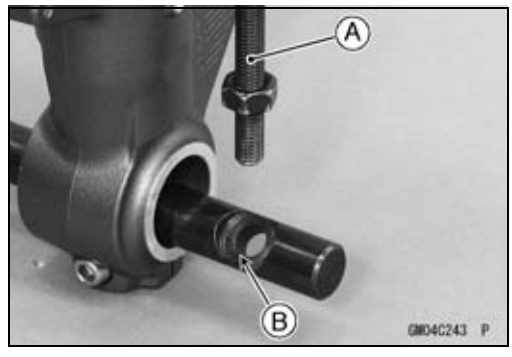
● Insert the holder bar [A] into the axle hole of the front fork [B].

Special Tool - Bar: 57001-1694 (For Left Fork Leg)

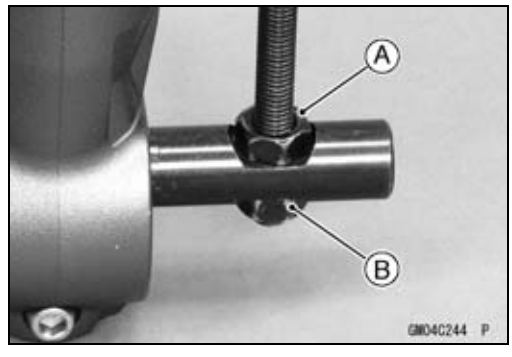
○Position the bar left and right and evenly.



● Insert the compression shaft and install the nut.
● Insert the lower end of the compression shaft [A] into the hole [B] of the holder bar.

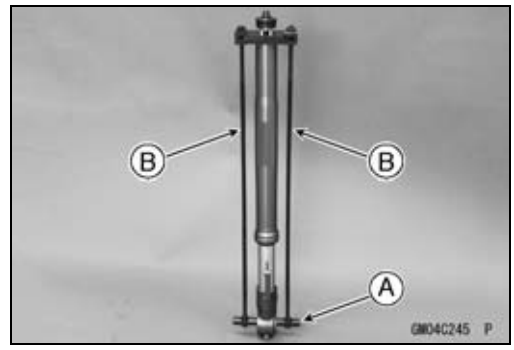


● Screw the adjust nut [A] onto the compression shaft as shown in the figure.
● Screw the locknut [B].
● Set the other side compression shaft same process.

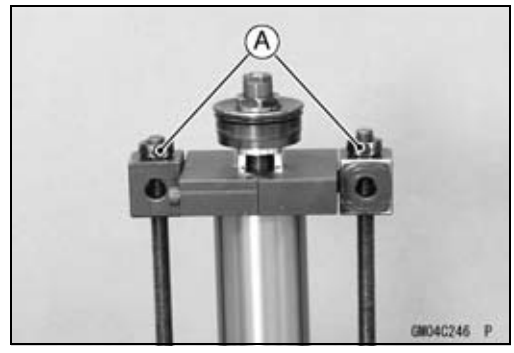


Front Fork

- Set the holder bar [A] and compression shafts [B].

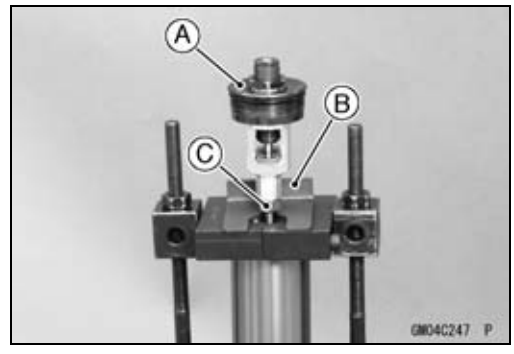


- Screw in the nuts [A] until the piston rod nut comes out.

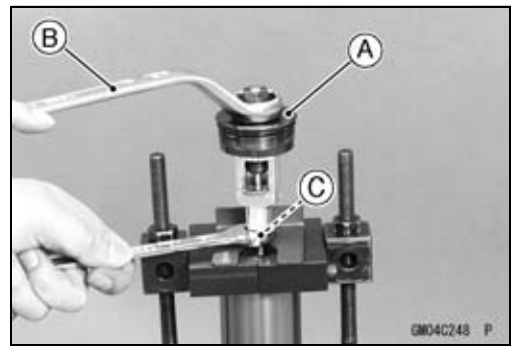


- While holding up the top plug [A], insert the fork spring stopper [B] between the piston rod nut [C] and the slider.

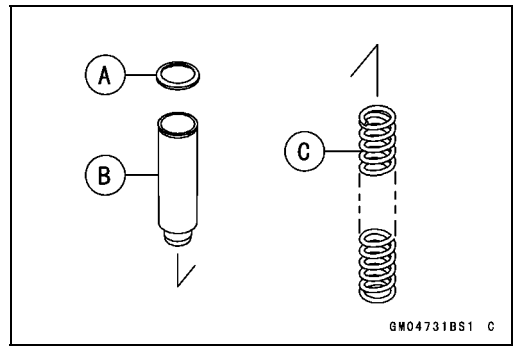
  Special Tool - Fork Spring Stopper: 57001-1374



- Holding the top plug [A] with a wrench [B], loosen the piston rod nut [C].



- Remove:
  Top Plug
  Rebound Damping Adjuster Rod (Right Front Fork Only)
  Washer [A]
  Collar [B]
  Fork Spring [C]

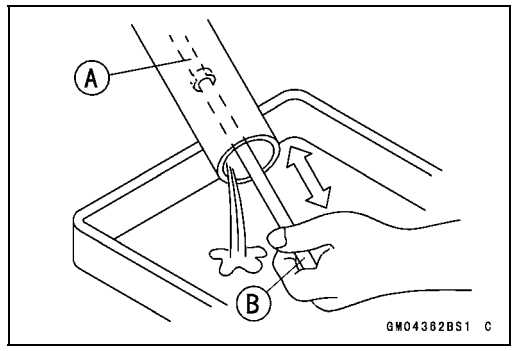


Front Fork

● Drain the fork oil into a suitable container and remove the spring seat.

○Pump the piston rod [A] up and down at least ten times to expel the oil from the fork.

Special Tool - Fork Piston Rod Puller, M10 × 1.0 [B]: 57001 -1298



● Hold the fork tube upright, press the outer tube [A] and the piston rod all the way down.

● Pour in the type and amount of fork oil specified.

Fork Oil

Recommended Oli:

KHL15-10 or equivalent

Amount (Per Side):

When changing oil (for reference):

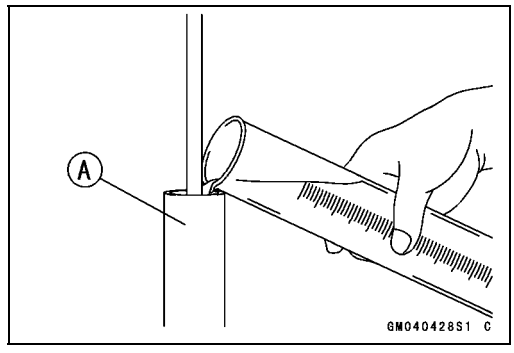
Right Front Fork Approx. 450 mL (15.2 US oz.)

Left Front Fork Approx. 455 mL (15.4 US oz.)

After disassembly and completely dry:

Right Front Fork 528 ±4 mL (17.9 ±0.1 US oz.)

Left Front Fork 535 ±4 mL (18.1 ±0.1 US oz.)



★Measure the oil level as follows.

○Hold the inner tube vertically in a vise.

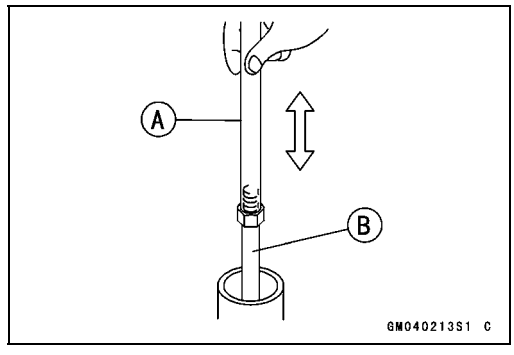
○Using the piston rod puller [A], move the piston rod [B] up and down more than ten times in order to expel all the air from the fork oil.

Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298

○Remove the piston rod puller.

○Wait until the oil level settles.

○With the fork fully compressed and the piston rod fully pushed in, insert a tape measure or rod into the inner tube, and measure the distance from the top of the outer tube to the oil.



Front Fork

Oil Level (fully compressed, without spring)
Standard:

Right Front Fork 115 ±2 mm (4.53 ±0.08 in.) (from the top of the outer tube)

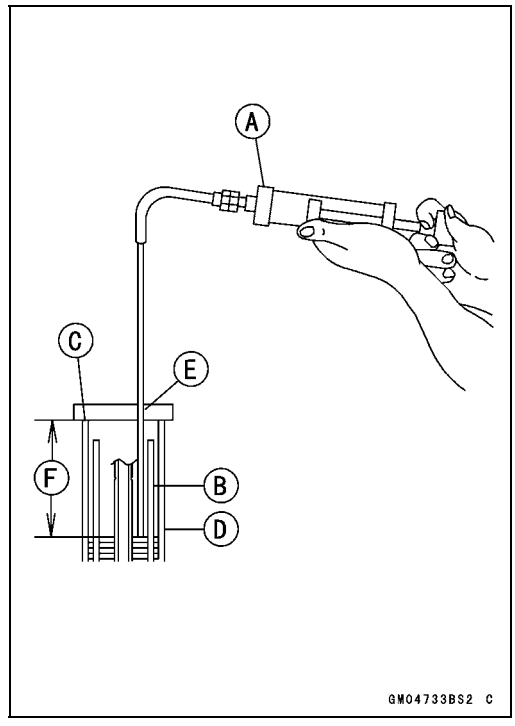
Left Front Fork 114 ±2 mm (4.49 ±0.08 in.) (from the top of the outer tube)

NOTE

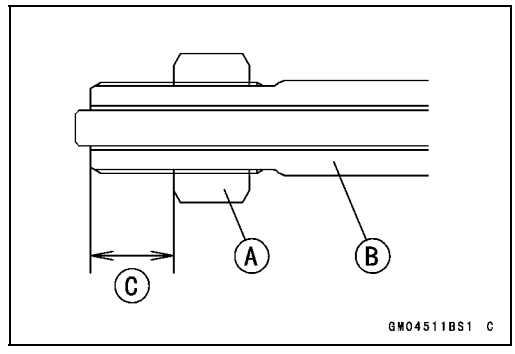
○*Fork oil level may also be measured using the fork oil level gauge.*

Special Tool - Fork Oil Level Gauge [A]: 57001-1290

○With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [B] and position the stopper across the top end [C] of the outer tube [D].
○Set the gauge stopper [E] so that its lower side shows the oil level distance specified [F].
○Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
★If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



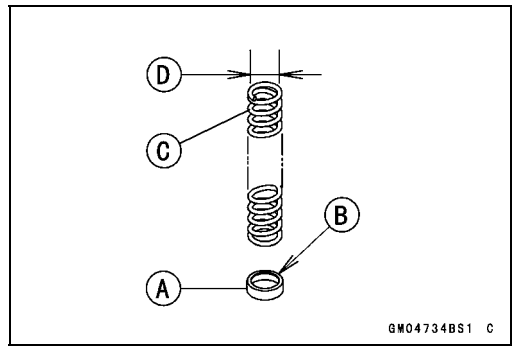
● Screw the rod nut [A] onto the piston rod [B] as shown in the figure.
15 mm (0.59 in.) or more [C]



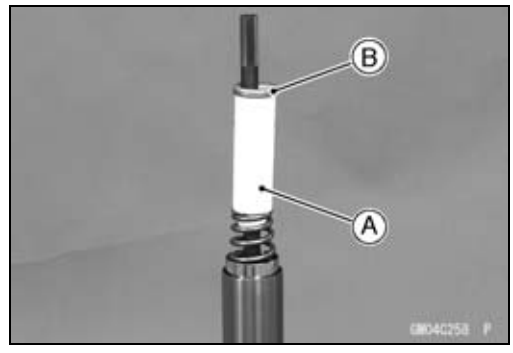
● Screw the fork piston rod puller onto the end of the piston rod.

Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298

● Install the spring seat [A] with the flat surface [B] facing upward.
● Install the fork spring [C] with the smaller end [D] facing upward.

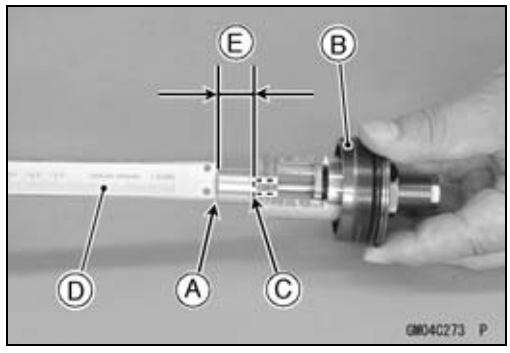


● Install:
Collar [A]
Washer [B]



Front Fork

- Check the distance between the lower end [A] of the top plug [B] and lower end [C] of the rebound damping adjuster with a vernier caliper [D] (Right Front Fork Only).
  14.5 mm (0.571 in.) or more [E]

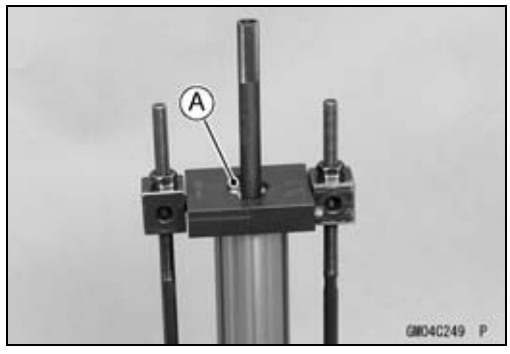


- Set the fork spring compressor on the washer [A] using the outer tube as a guide.

Special Tools - Fork Spring Compressor: 57001-1587
Fork Spring Compressor: 57001-1540

NOTE

○*Set the cutout of the clamp to the slider.*



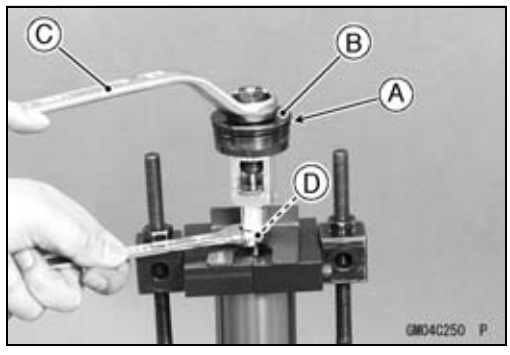
- While holding up the piston rod puller, insert the fork spring stopper between the piston rod nut and the slider.

Special Tool - Fork Spring Stopper: 57001-1374

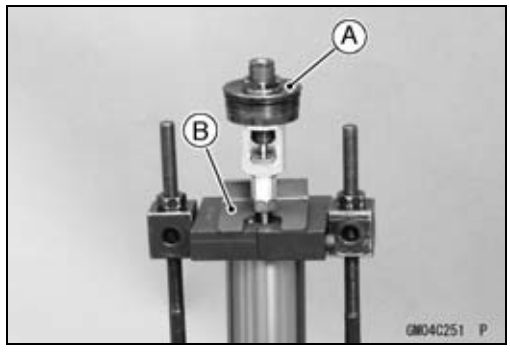
- Remove the piston rod puller.
- Insert the rebound damping adjuster rod into the holes of the piston rod (Right Side Only).

- Replace the O-ring [A] on the top plug with a new one.
- Apply grease to the new O-ring.
- Screw in the top plug until it stops onto the piston rod.
- Holding the top plug [B] with a wrench [C], tighten the piston rod nut [D] against the top plug.

Torque - Piston Rod Nuts: 15 N·m (1.5 kgf·m, 11 ft·lb)



- While holding up the top plug [A], pull out the fork spring stopper [B].
- Remove the fork spring compressor.
- Raise the outer tube and screw the top plug into it.
- Install the front fork (see Front Fork Installation).
- Adjust the spring preload (see Spring Preload Adjustment).
- Adjust the rebound damping force (see Rebound Damping Force Adjustment, Right Front Fork Only)

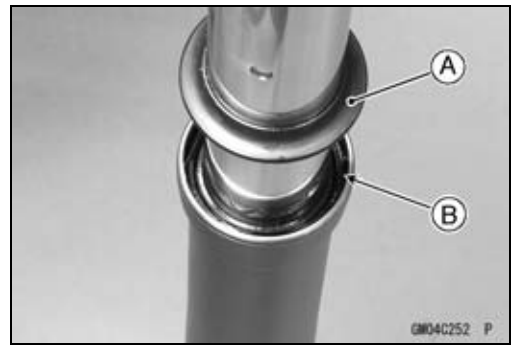


Front Fork Disassembly

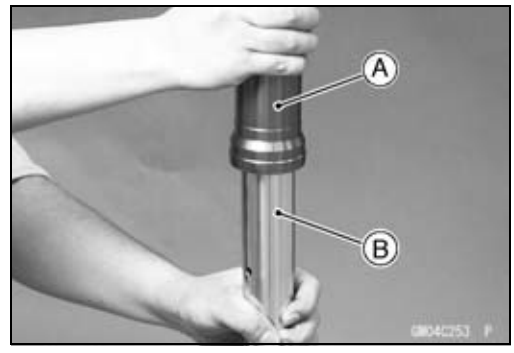
- Remove the front fork (see Front Fork Removal).
- Drain the fork oil (see Fork Oil Change).

Front Fork

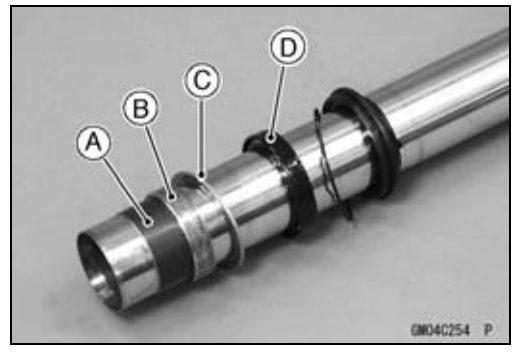
● Separate the inner tube from the outer tube as follows.
○Slide up the dust seal [A].
○Remove the retaining ring [B] from the outer tube.



○Holding the outer tube [A] by hand, pull the inner tube [B] several times to pull out the outer tube.



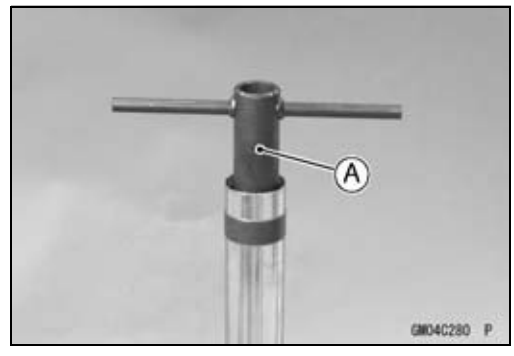
● Remove the inner tube guide bushing [A], outer tube guide bushing [B], washer [C], oil seal [D] from the inner tube.

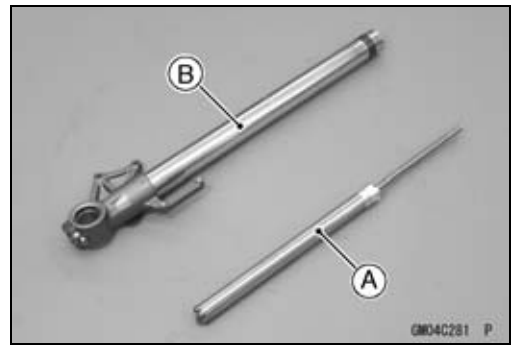


● Hold the inner tube lower end in a vice.
● Using the fork cylinder holder [A], loosen the cylinder unit.

Special Tool - Fork Cylinder Holder: 57001-1443

● Take the cylinder unit [A] out of the inner tube [B].
○Do not disassemble the cylinder unit and inner tube.

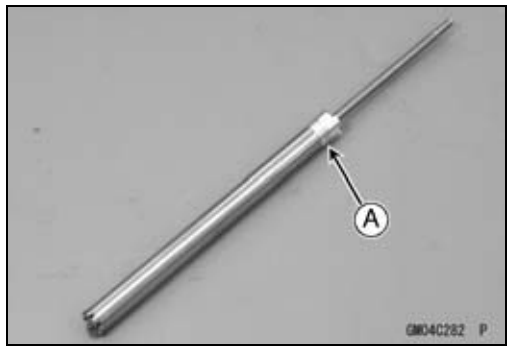




Front Fork

Front Fork Assembly

- Using a high flash-point solvent, clean off any oil or dirt that may be on the adhesive coating area. Dry them with a clean cloth.
- Apply adhesive (ThreeBond: TB1344N or equivalent) to the threads of the cylinder unit [A].

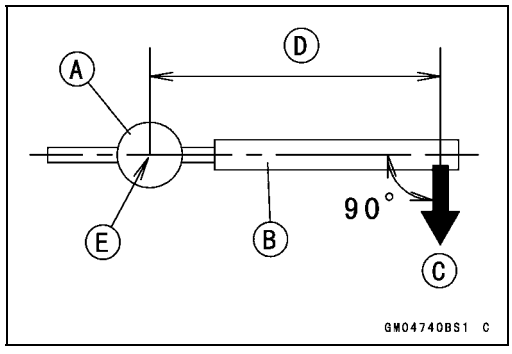


- Install the cylinder unit into the inner tube.
- Tighten the cylinder unit with the specified torque using the fork cylinder holder [A] and a suitable bar [B].

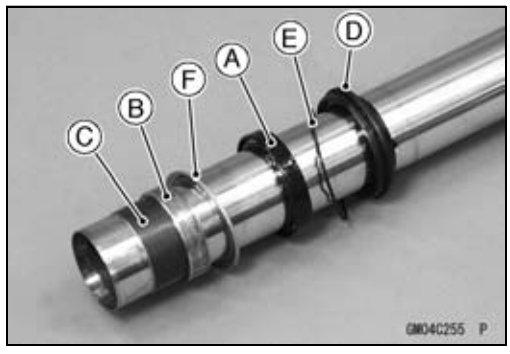
Special Tool - Fork Cylinder Holder: 57001-1443

Torque - Cylinder Unit: 60 N·m (6.1 kgf·m, 44 ft·lb)

○To tighten the cylinder unit with the specified torque, pull the bar with 200 N (20.4 kgf, 45.0 lbf) [C] force at the point of 300 mm (11.8 in.) [D] from the center [E] of the fork cylinder holder in the direction as shown.



- Replace the following parts with new one.
  Oil Seal [A]
  Outer Tube Guide Bushing [B]
  Inner Tube Guide Bushing [C]
  Dust Seal [D]
  Retaining Ring [E]
- Install the following parts onto the inner tube.
  Dust Seal
  Retaining Ring
  Oil Seal
  Washer [F]
  Outer Tube Guide Bushing
  Inner Tube Guide Bushing



- Insert the inner tube to the outer tube.
- Fit the new outer tube guide bushing [A] into the outer tube.

NOTE

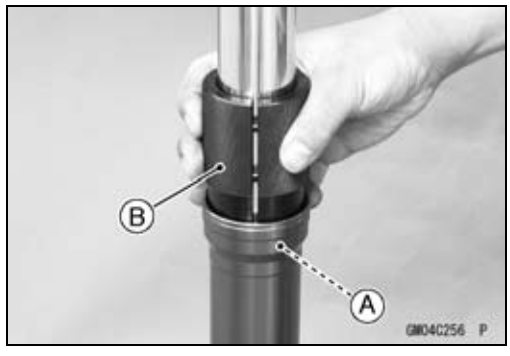
○*When assembling the new outer tube guide bushing, hold the washer against the new outer tube guide bushing and tap the washer with the fork oil seal driver [B] until it stops.*

Special Tool - Fork Oil Seal Driver, ϕ43: 57001-1530

- Install the oil seal by using the fork oil seal driver.

Special Tool - Fork Oil Seal Driver, ϕ43: 57001-1530

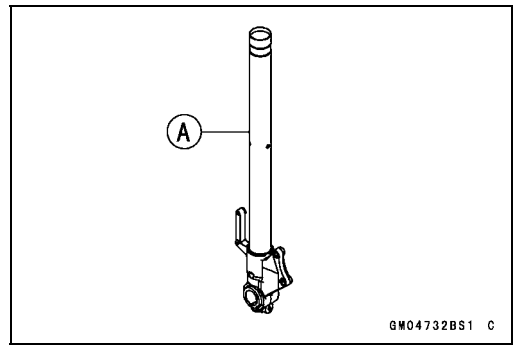
- Install the retaining ring and dust seal into the outer tube.



- Pour in the specified type of oil (see Fork Oil Change).

Front Fork

Inner Tube, Outer Tube Inspection

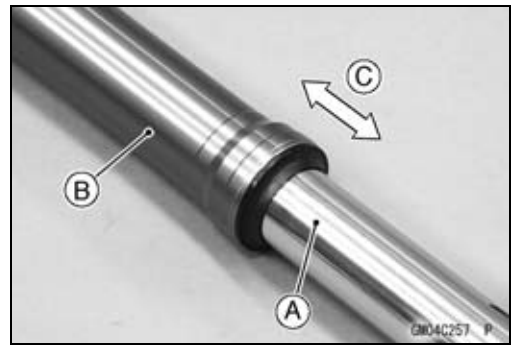


- Visually inspect the inner tube [A], and repair any damage.
- Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.

★If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

NOTICE

If the inner tube is badly bent or creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.



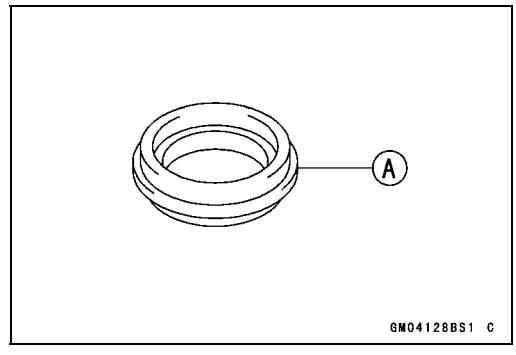
- Temporarily assemble the inner tube [A] and outer tube [B], and pump [C] them back and forth manually to check for smooth operation.

★If you feel binding or catching, the inner and outer tubes must be replaced.

⚠ WARNING

A straightened inner or outer fork tube may fall in use, possibly causing an accident resulting in serious injury or death. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.

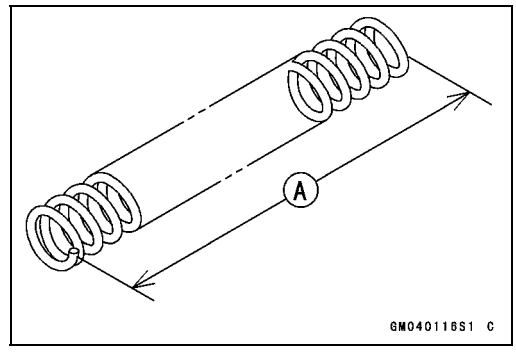
Dust Seal Inspection



- Inspect the dust seal [A] for any signs of deterioration or damage.

★Replace it if necessary.

Spring Tension Inspection



- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.

★If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

Spring Free Length

Standard: 282 mm (11.1 in.)

Service Limit: 276 mm (10.9 in.)

Rear Shock Absorber

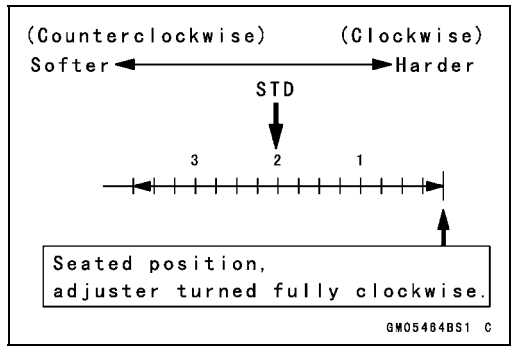
Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the lower damping adjuster [A] to the desired position, until you feel a click.

○The standard adjuster setting is the **2 turns out** from the fully clockwise position.

Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
3 3/4 turns out	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High



Spring Preload Adjustment

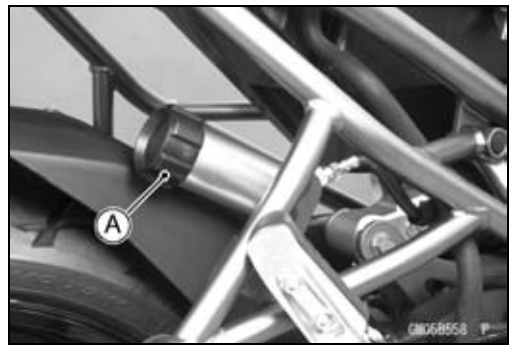
- To adjust the spring preload, turn in the adjuster [A] until you fee a click to the desired position.

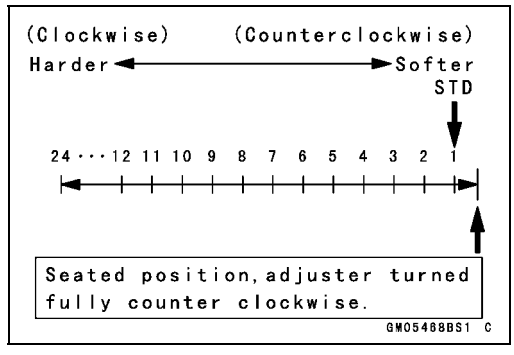
○The standard adjuster setting is the **1 click** from the fully counterclockwise position.

★If the spring action feels too soft, adjust it.

Spring Preload Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
1 click	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
24 clicks	Strong	Hard	Heavy	Bad	High



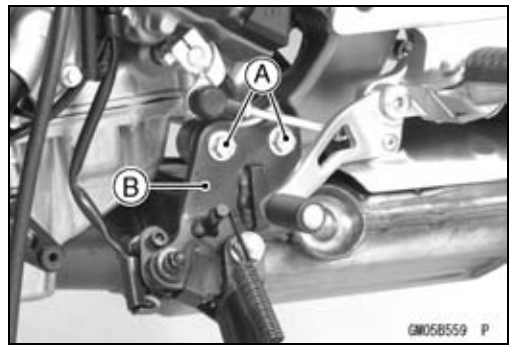


Rear Shock Absorber Removal

- Support the motorcycle with the stand.
- Remove:

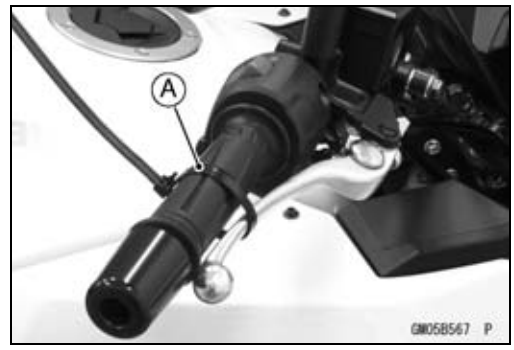
  Bolts [A]

  Sidestand Bracket [B] with the Sidestand



Rear Shock Absorber

- Squeeze the brake lever slowly and hold it with a band [A].

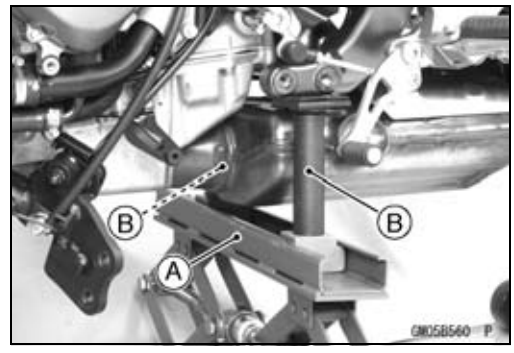


- Raise the rear wheel off the ground with the jack.

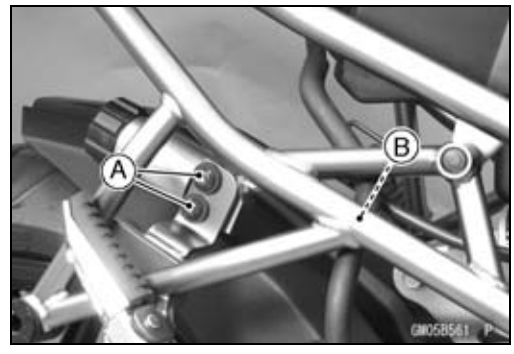
Special Tools - Jack [A]: 57001-1238
Jack Attachment [B]: 57001-1608

⚠ WARNING

Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.



- Remove:
  Rear Shock Absorber Bolts [A] and Bracket
  Clamp [B]



- Remove:
  Lower Rear Shock Absorber Nut and Bolt [A]
  Upper Rear Shock Absorber Bolt [B]
  Clamp [C]
- Remove the rear shock absorber [D] from rearside.

Rear Shock Absorber Installation

- Replace the rear shock absorber nut (lower) with a new one.
- Tighten:

Torque - Rear Shock Absorber Bolt and Nut (Upper and Lower): 34 N·m (3.5 kgf·m, 25 ft·lb)

Rear Shock Absorber

Rear Shock Absorber Inspection

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.
  Smooth Stroke
  Oil Leakage
  Crack or Dent

★If there is any damage to the rear shock absorber, replace it.

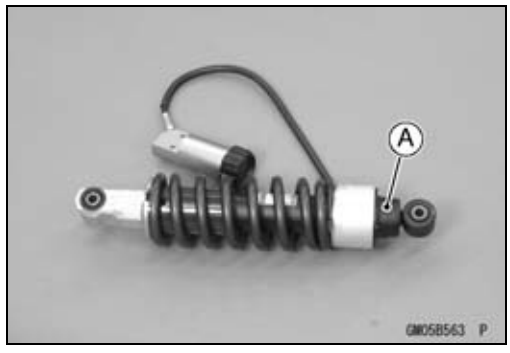
- Visually inspect the rubber bushing.

★If it show any signs of damage, replace it.

Rear Shock Absorber Scrapping

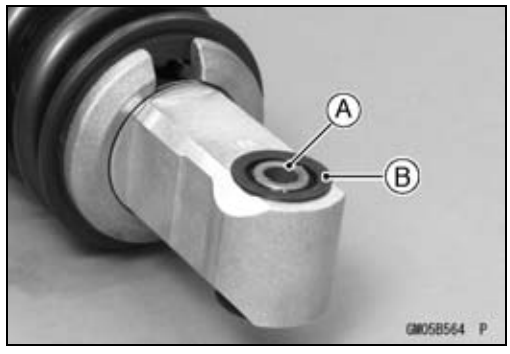
⚠ WARNING

Since the rear shock absorber contains nitrogen gas, do not incinerate the rear shock absorber without first releasing the gas or it may explode. Before a rear shock absorber is scrapped, drill a hole at the point [A] shown to release the nitrogen gas completely. Wear safety glasses when drilling the hole, as the gas may blow out bits of drilled metal when the hole opens.



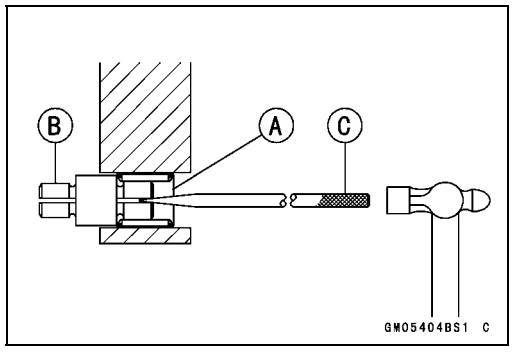
Rear Shock Absorber Bearing Removal

- Remove:
  Rear Shock Absorber (see Rear Shock Absorber Removal)
  Sleeve [A]
  Grease Seals [B]



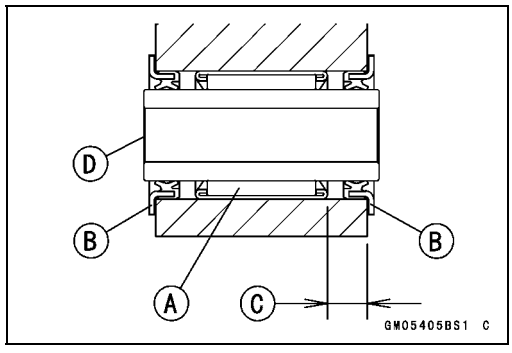
- Remove the needle bearing [A], using the bearing remover head [B] and bearing remover shaft [C].

Special Tools - Bearing Remover Head, ϕ15 × ϕ17: 57001-1267
Bearing Remover Shaft ϕ13: 57001-1377



Rear Shock Absorber Bearing Installation

- Replace the needle bearing [A] and grease seals [B] with new ones.
- Apply plenty of grease to the lips of the grease seals.
- Install the needle bearing position as shown.
  [C] 8.7 mm (0.34 in.)
- Install the grease seals and sleeve [D].

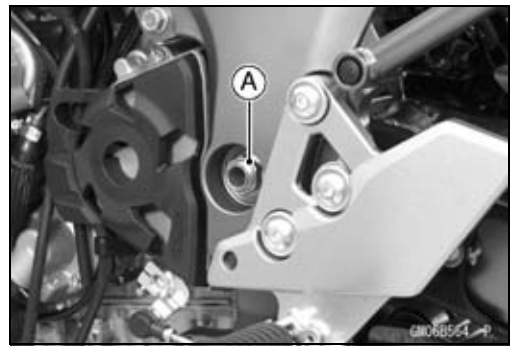


Swingarm

Swingarm Removal

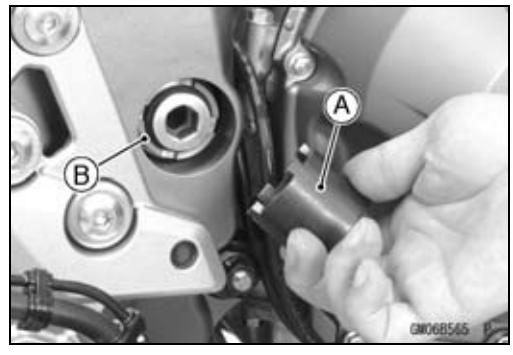
● Remove:
Rear Brake Hose Lower End (see Rear Caliper Removal in the Brakes chapter)
Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
Mud Guard (see Mad Guard Removal in the Frame chapter)
Rocker Arm (see Rocker Arm Removal)

● Unscrew the swingarm pivot shaft nut [A].



● Using the swingarm pivot nut wrench [A], loosen the swingarm pivot adjusting collar locknut [B].

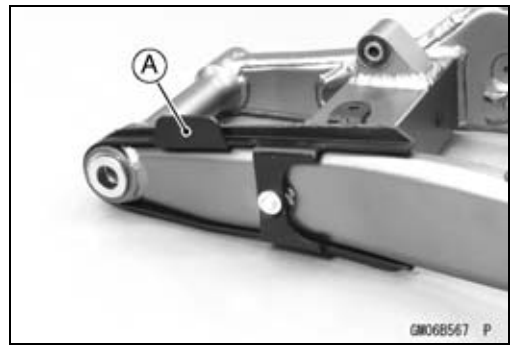
Special Tool - Swingarm Pivot Nut Wrench: 57001-1597



● Turn the swingarm pivot shaft [A] counterclockwise to free the adjusting collar from the swingarm.
○Make the gap between the adjusting collar and swingarm.
● Pull out the pivot shaft to the right side and remove the swingarm.

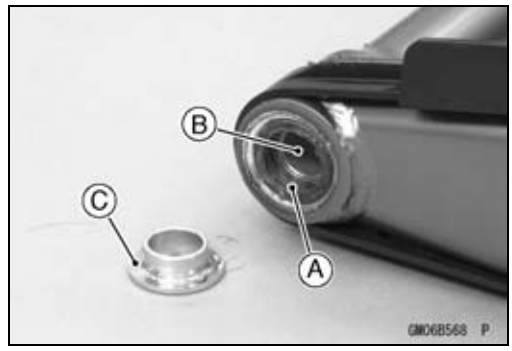
Swingarm Installation

● Visually inspect the chain guide [A].
★Replace the chain guide if it shows any signs of abnormal wear or damage.

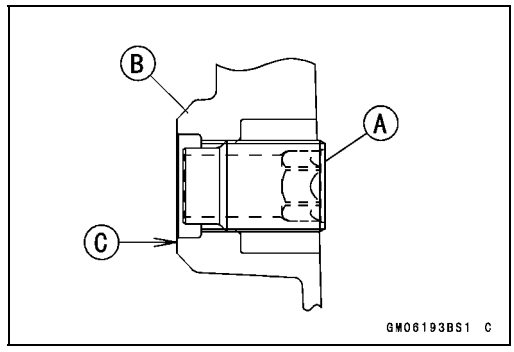


Swingarm

- Apply grease to the lips of the grease seals [A].
- Be sure to install the grease seals and sleeve [B] to the swingarm.
- Fit the collar [C] on the grease seal of the left side.



- Screw the swingarm pivot adjusting collar [A] into the frame [B] so that the collar does not project the swingarm mating surface [C].

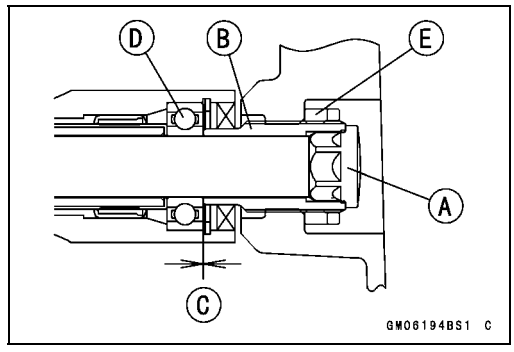


- Install the swingarm and insert the swingarm pivot shaft [A] into the adjusting collar [B] from the right side, and tighten the pivot shaft.

NOTE

○*Tighten the swingarm pivot shaft until the clearance [C] between the ball bearing [D] and collar comes to 0 mm (0 in.).*

Torque - Swingarm Pivot Shaft: 20 N·m (2.0 kgf·m, 15 ft·lb)



- Using the swingarm pivot nut wrench, tighten the swingarm pivot adjusting collar locknut [E].

Special Tool - Swingarm Pivot Nut Wrench: 57001-1597

Torque - Swingarm Pivot Adjusting Collar Locknut: 98 N·m (10 kgf·m, 72 ft·lb)

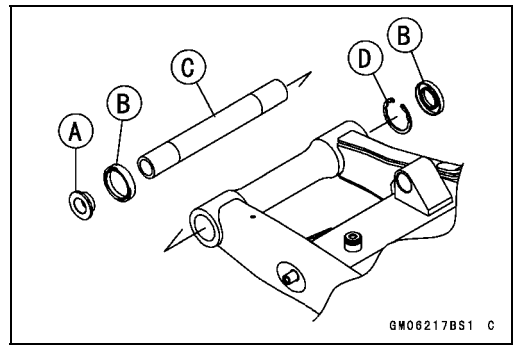
- Tighten the swingarm pivot shaft nut.

Torque - Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

- Move the swingarm up and down to check for abnormal friction.
- Install the removed parts (see appropriate chapters).

Swingarm

Swingarm Bearing Removal

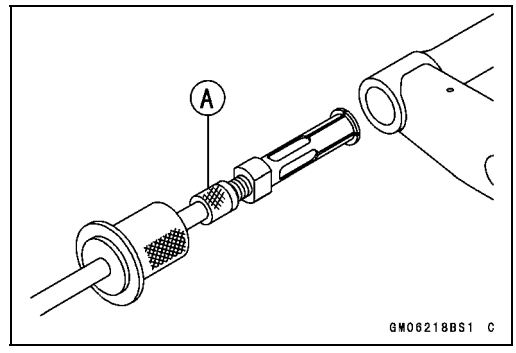


- Remove:
  Swingarm (see Swingarm Removal)
  Collar [A]
  Grease Seals [B]
  Sleeve [C]
  Circlip (Right Side) [D]

Special Tool - Inside Circlip Pliers: 57001-143

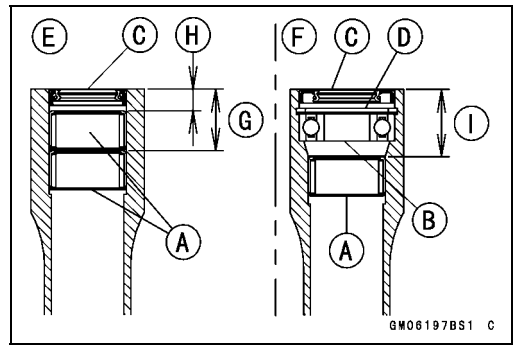
- Remove the ball bearing and needle bearings.

Special Tool - Oil Seal & Bearing Remover [A]: 57001-1058



Swingarm Bearing Installation

- Replace the needle bearings [A], ball bearing [B], grease seals [C] and circlip [D] with new ones.
- Install the needle bearings as shown in the figure.
  [E] Left Side
  [F] Right Side
  [G] 27.5 mm (1.1 in.)
  [H] 9.5 mm (0.37 in.)
  [I] 29.5 mm (1.16 in.)



NOTE

○*Install the needle bearings so that the marked side faces out.*

Special Tool - Needle Bearing Driver, ϕ28: 57001-1610

○Press in the ball bearing until it bottomed.

Special Tool - Bearing Driver Set: 57001-1129

○Install the circlip.

Special Tool - Inside Circlip Pliers: 57001-143

○Press in the grease seals so that seal surface is flushed with the end of housing.

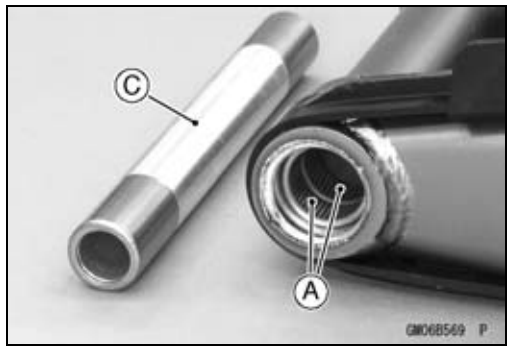
Special Tool - Bearing Driver Set: 57001-1129

Swingarm

Swingarm Bearing, Sleeve Inspection

NOTICE

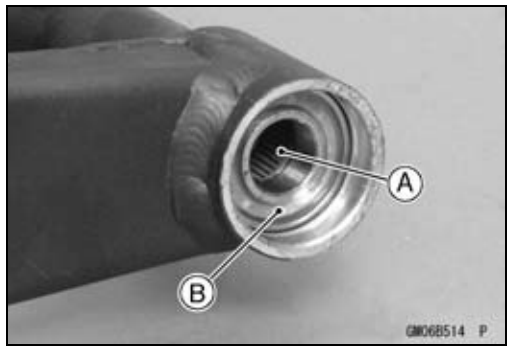
Do not remove the bearings for inspection. Removal may damage them.



- Inspect the needle bearings [A] and ball bearing [B] installed in the swingarm.

○The rollers and ball in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.

★If the needle bearing and sleeve [C] show any sings of abnormal wear, discoloration, or damage, replace them as a set.

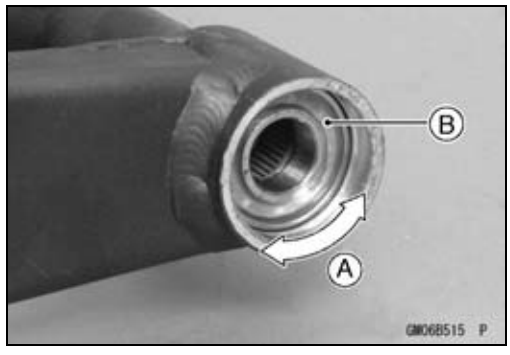


- Turn the bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.

★If bearing play, roughness, or binding is found, replace the bearing.

- Examine the bearing seal [B] for tears or leakage.

★If the seal is torn or is leaking, replace the bearing.



Swingarm Bearing Lubrication

NOTE

○*Since the bearings are packed with grease and sealed, lubrication is not required.*

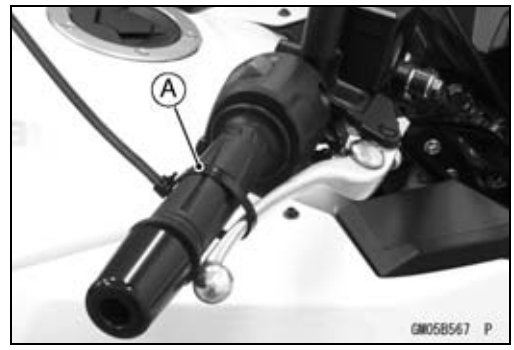
Chain Guide Inspection

- Refer to the Chain Guide Wear Inspection in the Periodic Maintenance chapter.

Tie-Rod, Rocker Arm

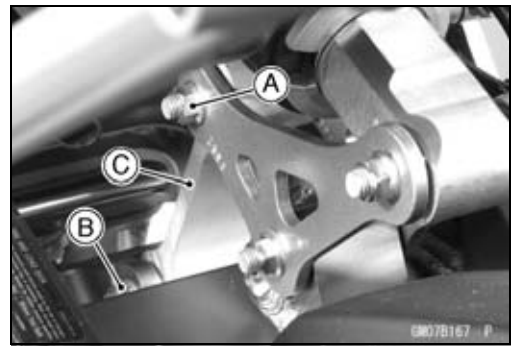
Tie-Rod Removal

- Remove:
  Upper Mud Guard (see Upper Mud Guard Removal in the Frame chapter)
- Squeeze the brake lever slowly and hold it with a band [A].



- Raise the rear wheel off the ground with the jack (see Rear Shock Absorber Removal).

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608



- Remove:
  Upper Tie-Rod Bolt and Nut [A]
  Lower Tie-Rod Bolt and Nut [B]
  Tie-Rod [C]

Tie-Rod Installation

- Apply grease to the inside of the grease seals.
- Install the tie-rod.
- Replace the tie-rod nuts with new ones.
- Tighten:

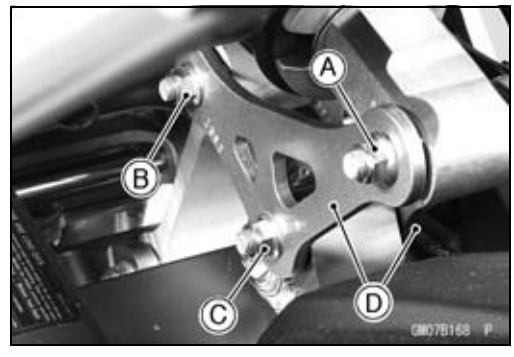
Torque - Tie-Rod Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

Rocker Arm Removal

- Remove:
  Upper Mud Guard (see Upper Mud Guard Removal in the Frame chapter)
- Squeeze the brake lever slowly and hold it with a band.
- Raise the rear wheel off the ground with the jack (see Rear Shock Absorber Removal).

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608

- Remove:
  Lower Rear Shock Absorber Bolt and Nut [A]
  Upper Tie-Rod Bolt and Nut [B]
  Rocker Arm Bolt and Nut [C]
  Rocker Arms [D]



Tie-Rod, Rocker Arm

Rocker Arm Installation

- Apply grease to the inside of the oil seals.
- Replace the rocker arm nut, tie-rod nuts and rear shock absorber nut with new ones.
- Tighten:

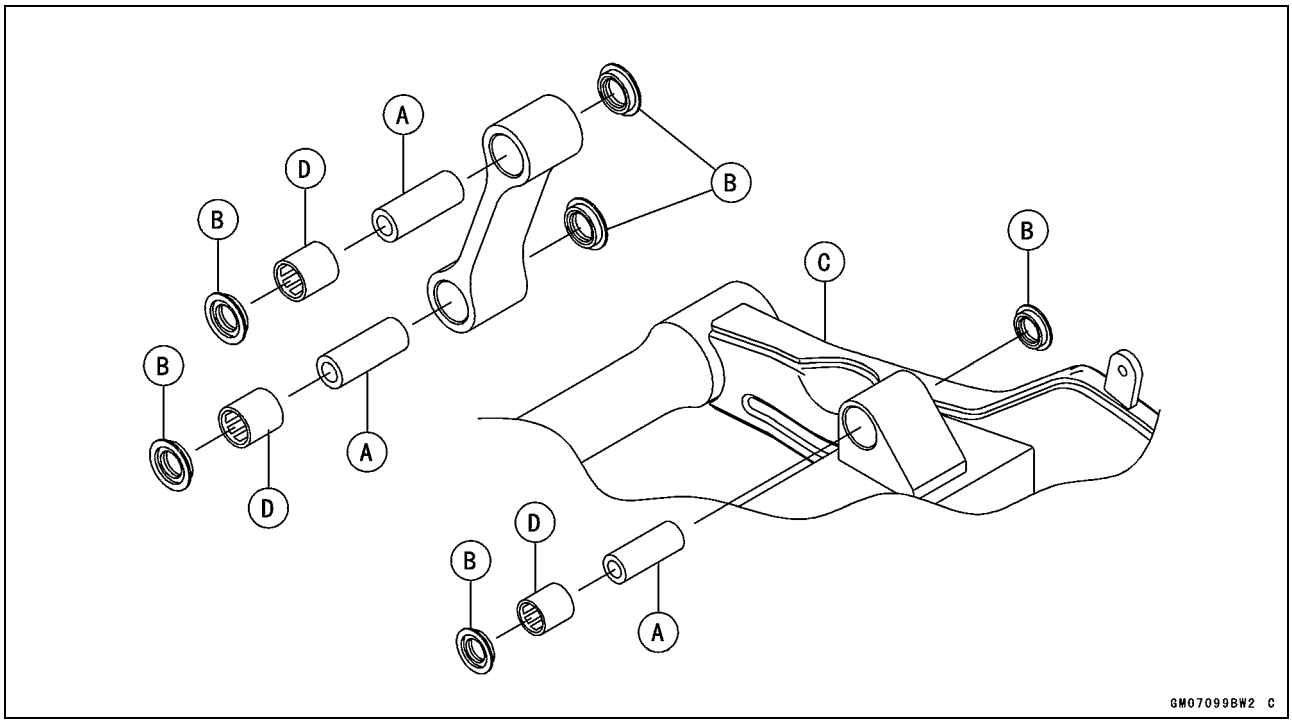
Torque - Rocker Arm Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)
Tie-Rod Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Rear Shock Absorber Nut (Lower): 34 N·m (3.5 kgf·m, 25 ft·lb)

- Install the removed parts (see appropriate chapters).

Tie-Rod and Rocker Arm Bearing Removal

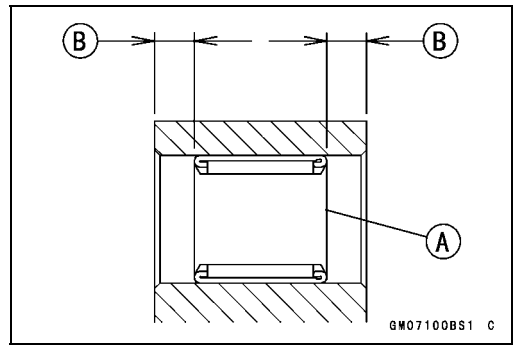
- Remove:
  Tie-Rods (see Tie-Rod Removal)
  Rocker Arm (see Rocker Arm Removal)
  Sleeves [A]
  Oil Seals [B]
  Swingarm [C] (see Swingarm Removal)
- Remove the needle bearings [D], using the bearing remover head and bearing remover shaft.

Special Tools - Bearing Remover Head, ϕ15 × ϕ17: 57001-1267
Bearing Remover Shaft, ϕ13: 57001-1377



Tie-Rod, Rocker Arm

Tie-Rod and Rocker Arm Bearing Installation



- Replace the needle bearing [A] and oil seals with new ones.
- Apply plenty of grease to the lips of the oil seals.
- Install the needle bearings and oil seals position as shown in the figure.

○Screw the needle bearing driver into the driver holder.

○Insert the needle bearing driver into the needle bearing and press the needle bearing.

7.5 mm (0.30 in.) [B]

NOTE

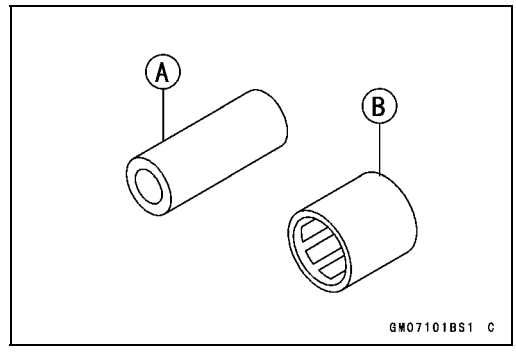
○*For a bearing of inner diameter ϕ17, select the pressing side of the needle bearing driver according to its pressing depth.*

Special Tools - Bearing Driver Set: 57001-1129
Needle Bearing Driver, ϕ17/ϕ18: 57001-1609

NOTE

○*Install the needle bearings so that the marked side faces in.*

Rocker Arm/Tie-Rod Bearing, Sleeve Inspection



NOTICE
Do not remove the bearings for inspection. Removal may damage them.

- Visually inspect the rocker arm, or tie-rod sleeves [A] and needle bearings [B].
- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If there is any doubt as to the condition of any of the needle bearings or sleeve, replace the sleeve and needle bearings as a set.

Rocker Arm/Tie-Rod Bearing Lubrication

NOTE

○*Since the bearings are packed with grease, lubrication is not required.*

Steering

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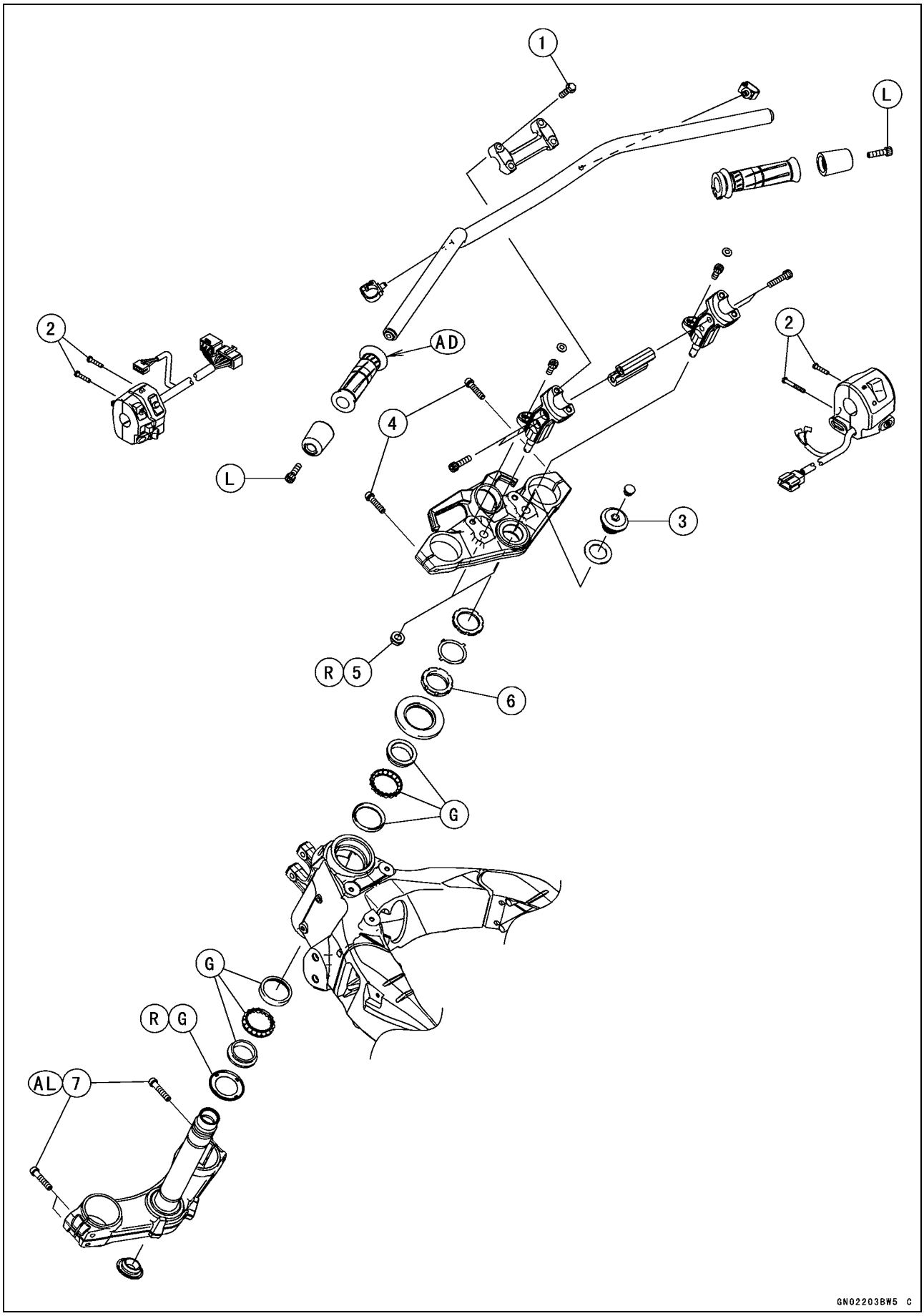
Exploded View



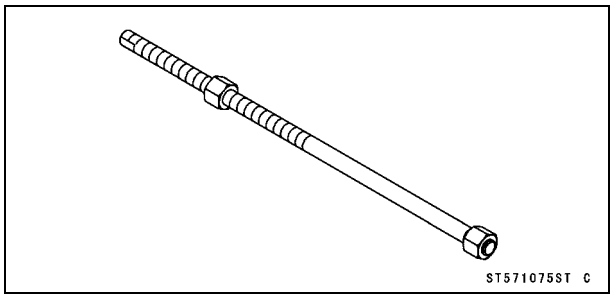
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Holder Bolts	25	2.5	18	
2	Switch Housing Screws	3.5	0.36	31 in·lb	
3	Steering Stem Head Bolt	108	11.0	79.7	
4	Upper Front Fork Clamp Bolts	20	2.0	15	
5	Handlebar Holder Mounting Nuts	34	3.5	25	R
6	Steering Stem Nut	25	2.5	18	
7	Lower Front Fork Clamp Bolts	20.5	2.09	15.1	AL

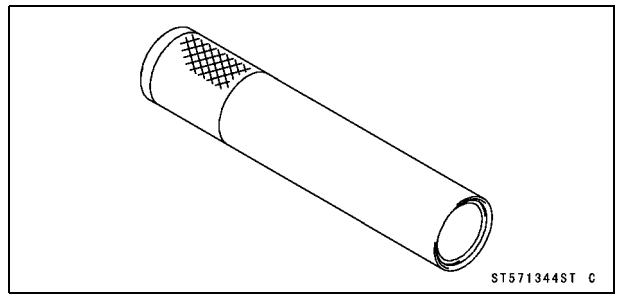
AD: Apply adhesive.
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
R: Replacement Parts
L: Apply a non-permanent locking agent.

Special Tools

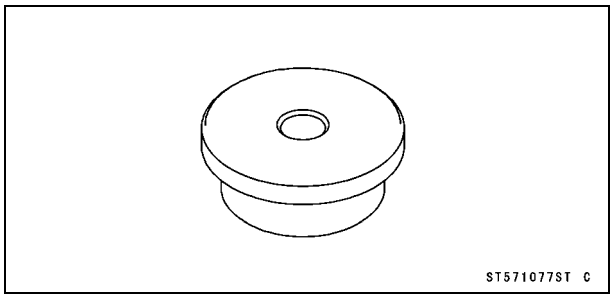
Head Pipe Outer Race Press Shaft:
57001-1075



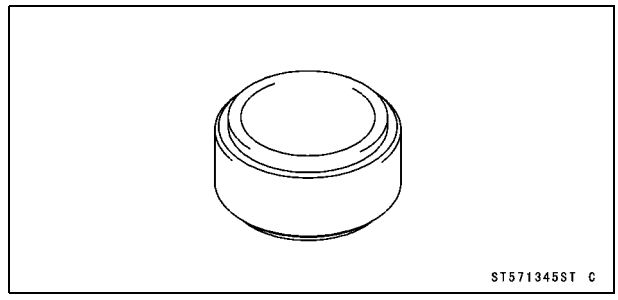
Steering Stem Bearing Driver, ϕ42.5:
57001-1344



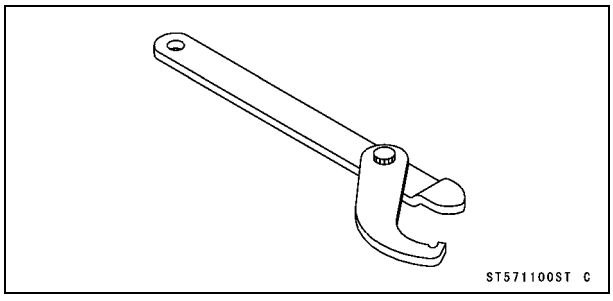
Head Pipe Outer Race Driver, ϕ54.5:
57001-1077



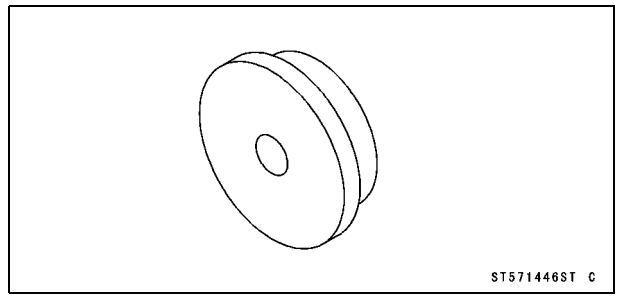
Steering Stem Bearing Driver Adapter, ϕ41.5:
57001-1345



Steering Stem Nut Wrench:
57001-1100



Head Pipe Outer Race Driver, ϕ55:
57001-1446



Steering

Steering Inspection

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

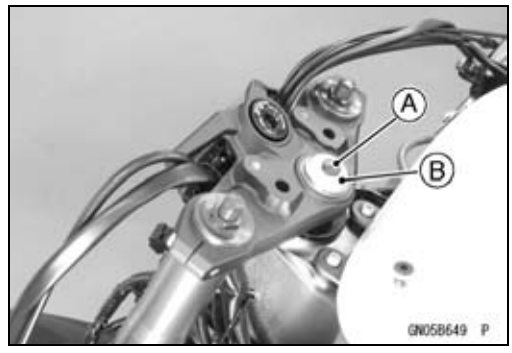
Steering Adjustment

- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

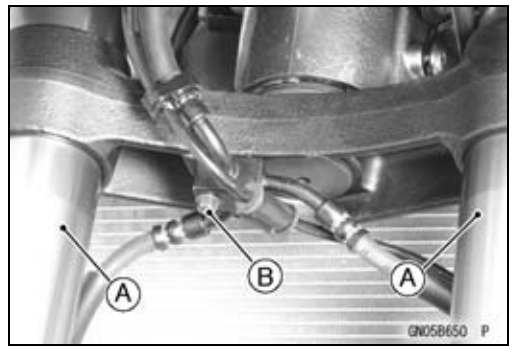
Steering Stem

Stem, Stem Bearing Removal

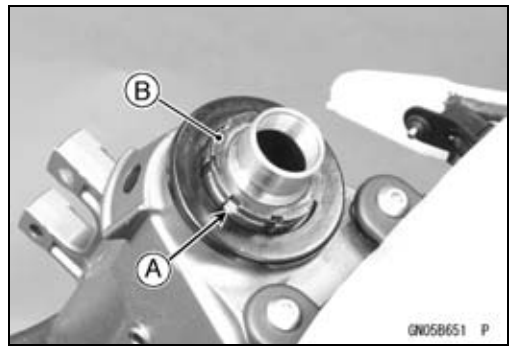
- Remove:
  Upper Fairing Bracket (see Upper Fairing Bracket Removal in the Frame chapter)
  Handlebars and Lower Handlebar Holder (see Handlebar Removal)
  Steering Stem Head Bolt Plug [A]
  Steering Stem Head Bolt [B] and Washer



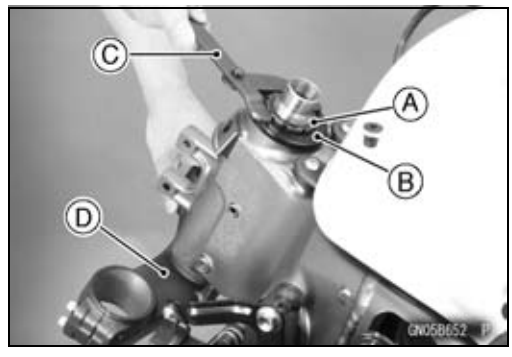
- Remove:
  Front Forks [A] (see Front Fork Removal in the Suspension chapter)
  Steering Stem Head
  Brake Hose Fitting Bolt [B]



- Bend the claws [A] of claw washer back.
- Remove the steering stem locknut [B].
  Special Tool - Steering Stem Nut Wrench: 57001-1100
- Remove the claw washer.



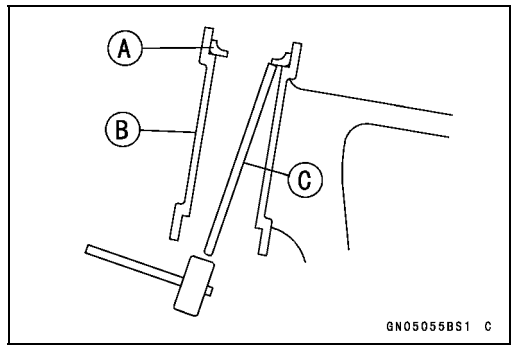
- Pushing up the stem base, and remove the steering stem nut [A] with stem cap [B].
  Special Tool - Steering Stem Nut Wrench [C]: 57001-1100
- Remove:
  Steering Stem [D]
  Upper Ball Bearing Inner Race and Ball Bearing



- To remove the ball bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses of head pipe, and applying it to both recess alternately hammer it to drive the race out.

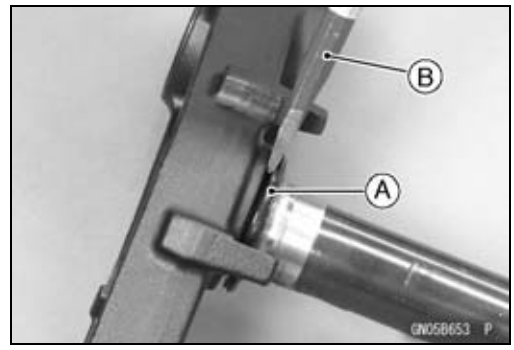
NOTE

○*If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.*



Steering Stem

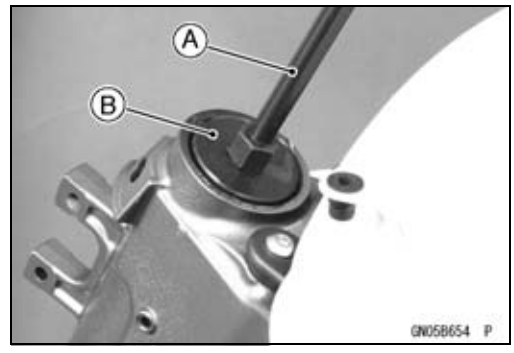
● Remove the lower ball bearing inner race (with its oil seal) [A] which is pressed onto the steering stem with a suitable commercially available chisel [B].



Stem, Stem Bearing Installation

● Replace the bearing outer races with new ones.
● Drive them into the head pipe at the same time.

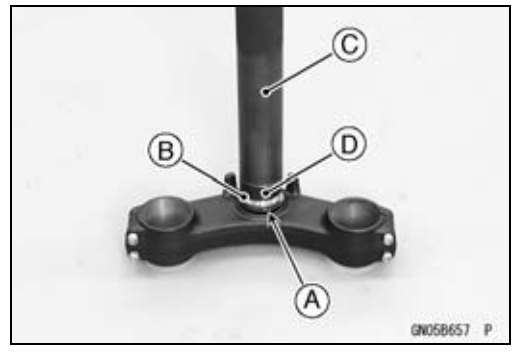
Special Tools - Head Pipe Outer Race Press Shaft [A]: 57001-1075
Head Pipe Outer Race Driver, ϕ54.5 [B]: 57001-1077
Head Pipe Outer Race Driver, ϕ55: 57001 -1446



● Apply grease to the outer races.

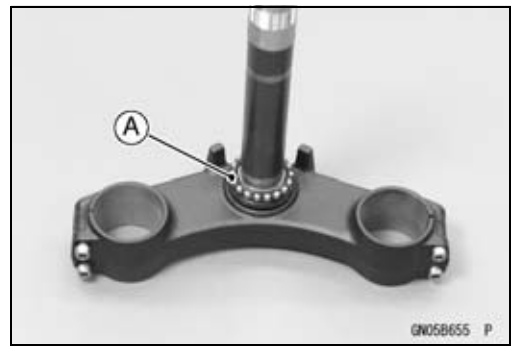
● Replace the bearing inner races and oil seal with new ones.
● Apply grease to the oil seal.
● Install the oil seal [A] on the steering stem, and drive the lower ball bearing inner race [B] applied the grease onto the stem.

Special Tools - Steering Stem Bearing Driver, ϕ42.5 [C]: 57001-1344
Steering Stem Bearing Driver Adapter, ϕ41.5 [D]: 57001-1345

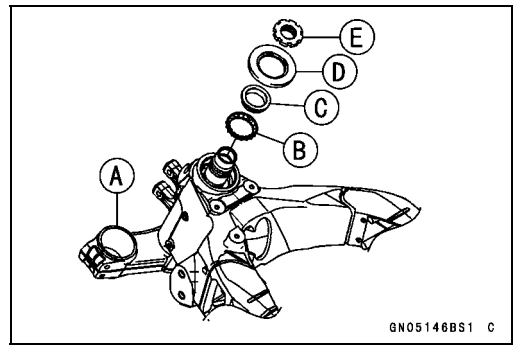


● Install the lower ball bearing [A] onto the stem.
● Grease the following.
Inner and Outer Races
Lower and Upper Ball Bearings

○The lower and upper ball bearings are identical.



● Install the stem [A] through the head pipe and install the ball bearing [B] and inner race [C] on it.
● Install:
Stem Cap [D]
Steering Stem Nut [E]



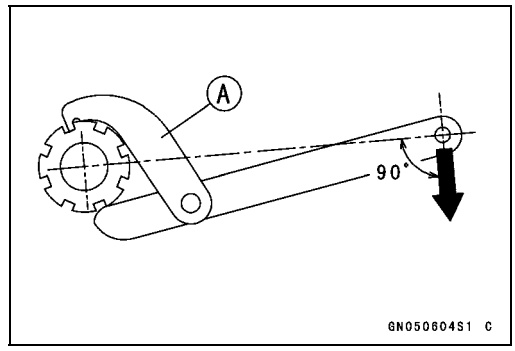
Steering Stem

● Settle the bearings in place as follows.

○Tighten the steering stem nut with **55 N·m (5.6 kgf·m, 41 ft·lb)** of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using a steering stem nut wrench [A].

Special Tool - Steering Stem Nut Wrench: 57001-1100

Torque - Steering Stem Nut: 25 N·m (2.5 kgf·m, 18 ft·lb)



● Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].

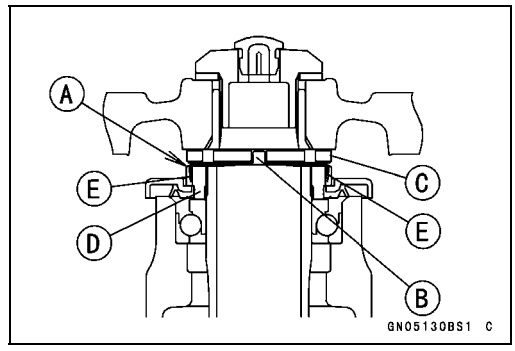
● Hand tighten the stem locknut until the claw washer touches the steering stem nut.

● Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].

● Install the stem head.

● Install the washer, and temporary tighten the steering stem head bolt.

● Install the front forks (see Front Fork Installation in the Suspension chapter).



NOTE

○*Tighten the lower front fork clamp bolts first, next the stem head bolt, last the upper front fork clamp bolts.*

○*Tighten the lower front fork clamp bolts alternately two times to ensure even tightening torque.*

Torque - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 79.7 ft·lb)
Lower Front Fork Clamp Bolts: 20.5 N·m (2.09 kgf·m, 15.1 ft·lb)

⚠ WARNING

If the handlebar does not turn to the steering stop it may cause an accident resulting in injury or death. Be sure the cables,harnesses and hoses are routed properly and do not interfere with handlebar movement (see Cable, Wire, and Hose Routing section in the Appendix chapter).

● Install the removed parts (see appropriate chapters).

Steering Stem Bearing Lubrication

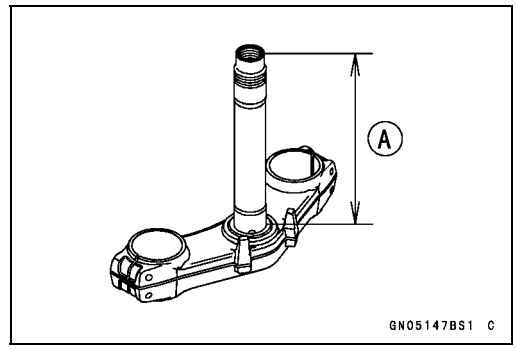
● Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

Steering Stem

Steering Stem Warp Inspection

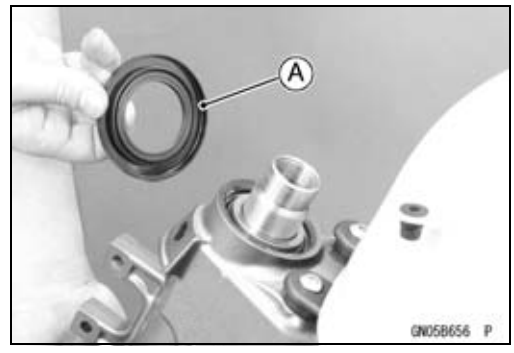
- Whenever the steering stem is removed, or if the steering can not be adjusted for smooth action, check the steering stem for straightness.

★If the steering stem [A] is bent, replace the steering stem.



Stem Cap Deterioration, Damage Inspection

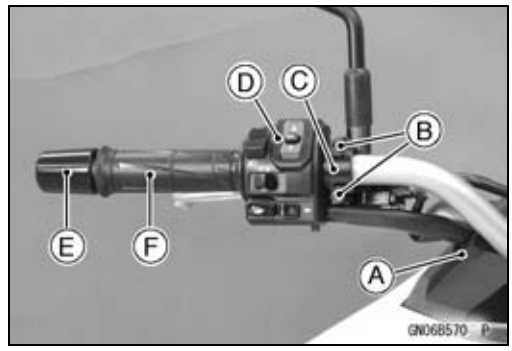
★Replace the stem cap if its oil seal [A] shows damage.



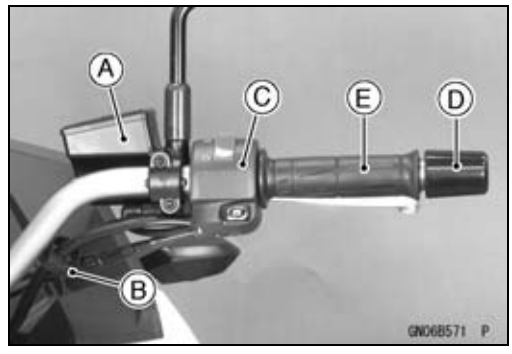
Handlebar

Handlebar Removal

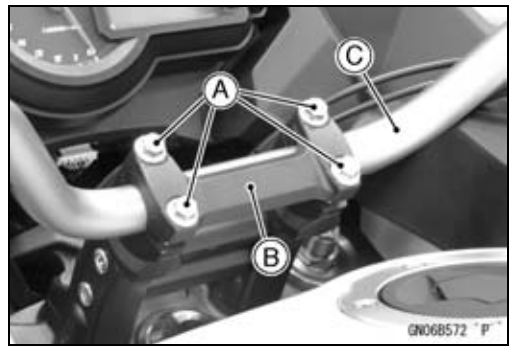
- Remove:
  Clamp [A]
  Clutch Lever Clamp Bolts [B]
  Clutch Lever Assembly [C]
  Left Switch Housing [D]
  Handlebar Weight [E]
  Handlebar Grip [F]



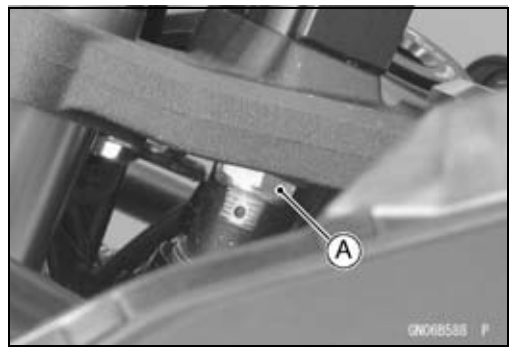
- Remove:
  Front Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
  Clamp [B]
  Right Switch Housing [C]
  Handlebar Weight [D]
  Throttle Grip [E]



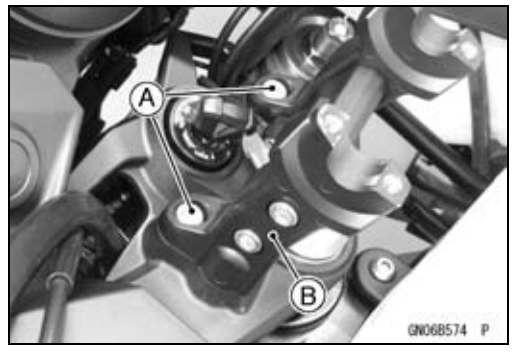
- Remove:
  Handlebar Holder Bolts [A]
  Handlebar Holder [B]
  Handlebars [C]



- Remove:
  Middle Fairing (see Middle Faring Removal in the Frame chapter)
  Handlebar Holder Mounting Nut [A] (Both Sides)

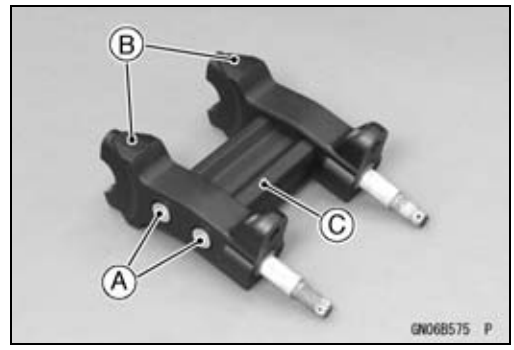


- Remove:
  Caps and Bolts [A]
  Lower Handlebar Holder Assembly [B]



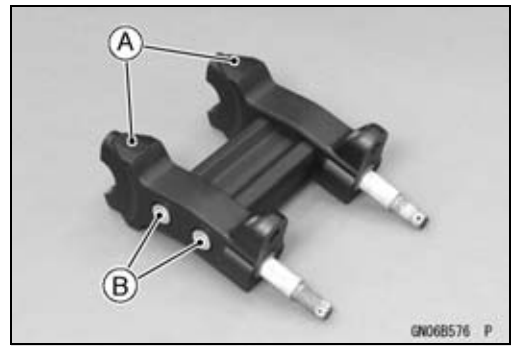
Handlebar

- Remove:
  Bolts [A] (Both Sides)
  Lower Handlebar Holders [B]
  Lower Handlebar Holder Brace [C]

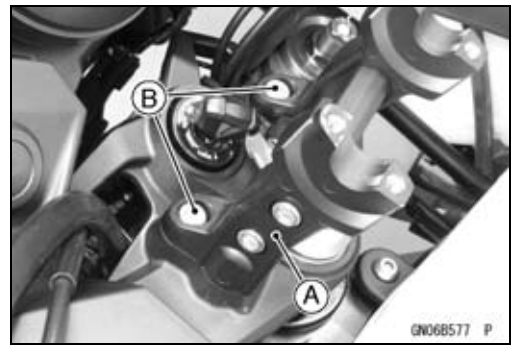


Handlebar Installation

- Install:
  Lower Handlebar Holders [A]
  Bolts [B] (Both Sides)

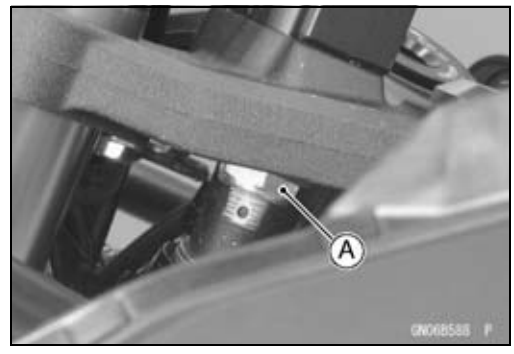


- Install:
  Lower Handlebar Holder Assembly [A]
  Bolts [B] and Caps



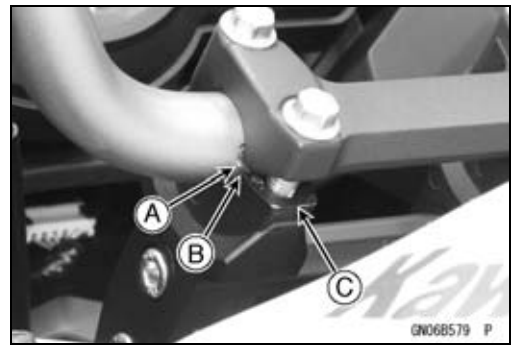
- Replace the handlebar holder mounting nuts [A] with new ones.

Torque - Handlebar Holder Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)



- Align the punch mark [A] on the handlebars and the corner edge [B] on the lower handlebar holder.
- Tighten the front holder bolts first, and then the rear holder bolts. There will be a gap [C] at the rear part of the holder after tightening.

Torque - Handlebar Holder Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



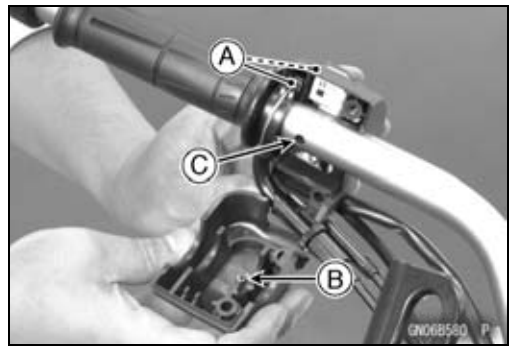
Handlebar

- Install:
  Throttle Grip
  Throttle Cable Tips [A]
  Right Switch Housing

○Fit the projection [B] into a hole [C] in the handlebars.

- Tighten:

Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)



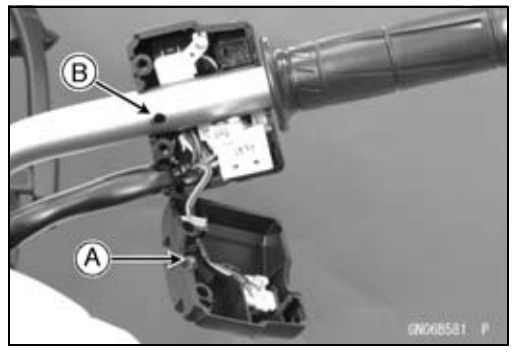
- Apply a non-permanent locking agent to the right handlebar weight bolt.
- Install the front brake master cylinder (see Front Master Cylinder Installation in the Brakes chapter).

- Apply adhesive cement to the inside of the left handlebar grip.
- Apply a non-permanent locking agent to the left handlebar weight bolt.
- Install the left switch housing.

○Fit the projection [A] into a hole [B] in the handlebars.

- Tighten:

Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)



- Install the clutch lever (see Clutch Lever Installation in the Clutch chapter).

- Run the leads, cables and hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Frame

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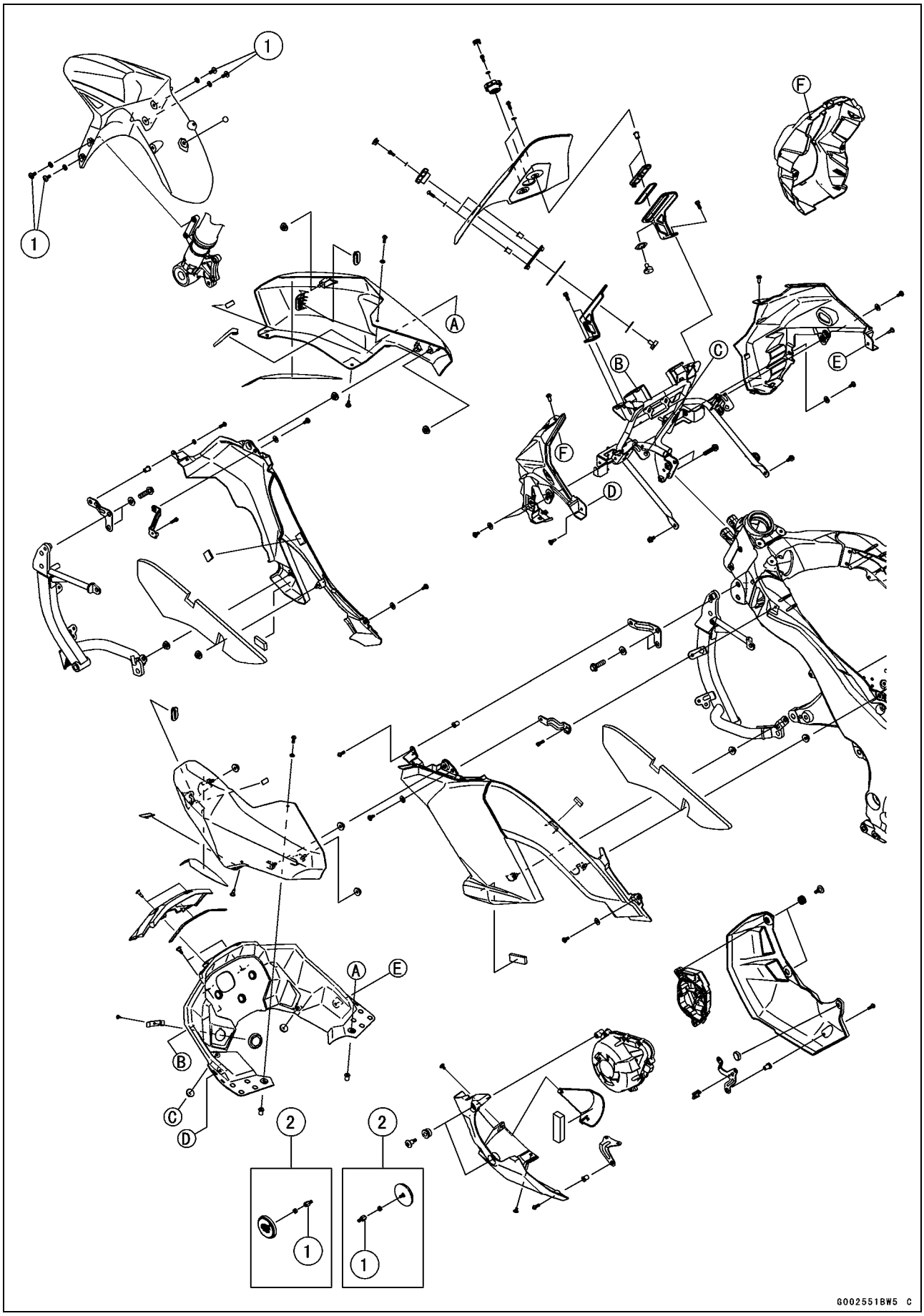
Exploded View

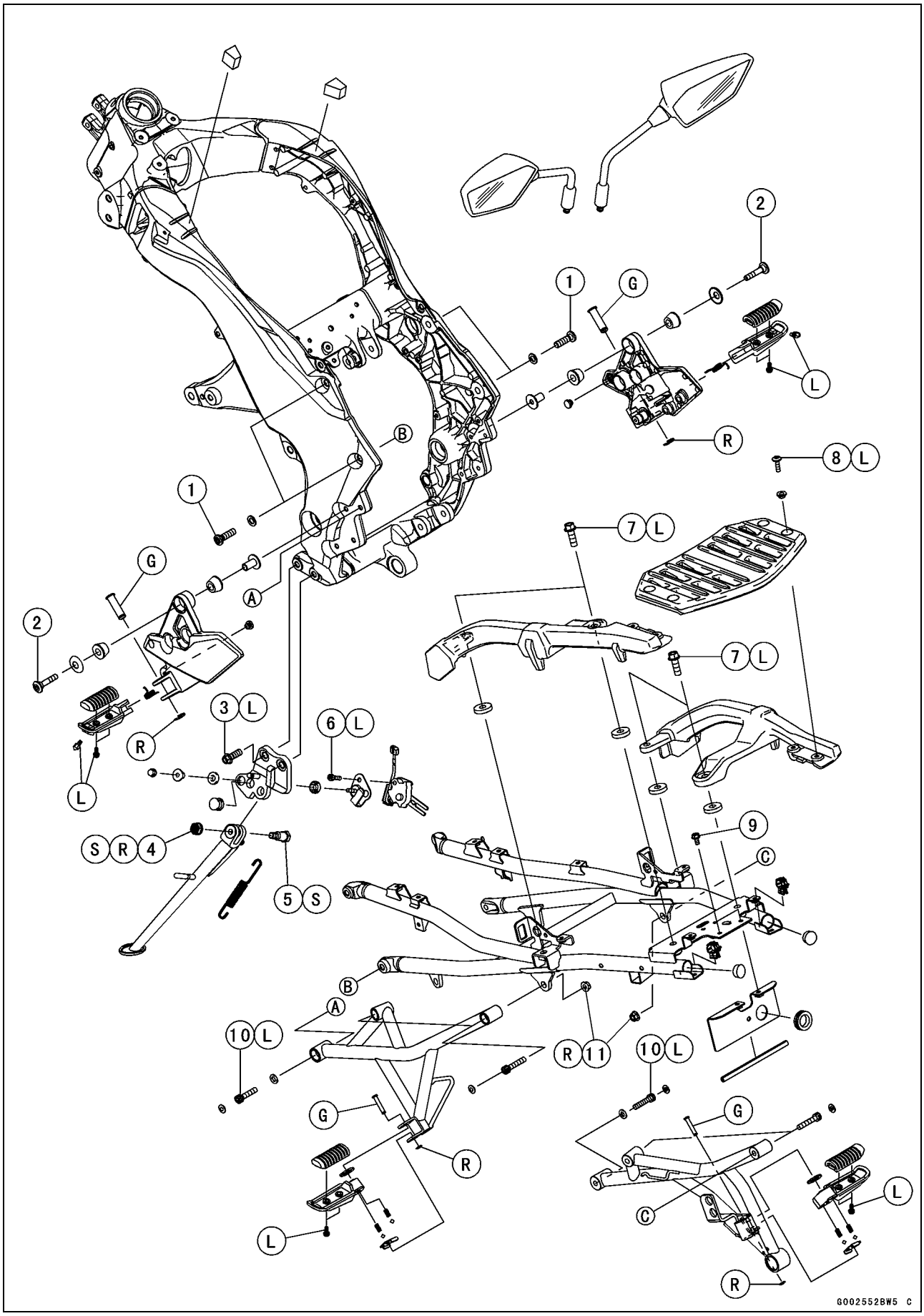


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fender Mounting Bolts	3.9	0.40	35 in·lb	

2. CA and AU Models

Exploded View

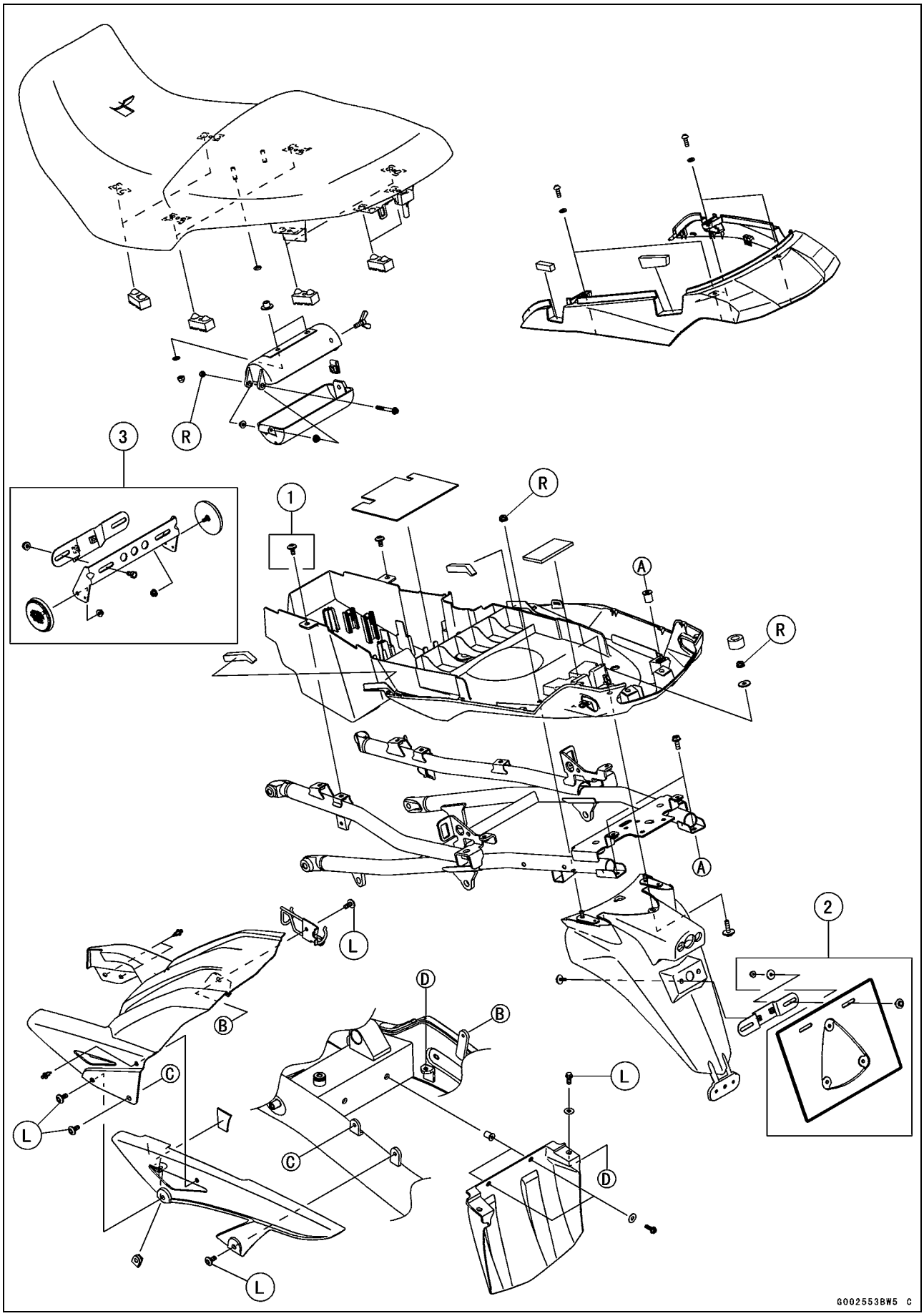


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Frame Bolts	44	4.5	32	
2	Front Footpeg Bracket Bolts	25	2.5	18	
3	Sidestand Bracket Bolts	49	5.0	36	L
4	Sidestand Nut	44	4.5	32	R, S
5	Sidestand Bolt	29	3.0	21	S
6	Sidestand Switch Bolt	8.8	0.90	78 in·lb	L
7	Carrier Bracket Bolts	34	3.5	25	L
8	Carrier Mounting Bolts	8.8	0.90	78 in·lb	L
9	Rear Frame Guard Bolts	8.8	0.90	78 in·lb	
10	Rear Footpeg Bracket Bolts (Lower)	28	2.9	21	L
11	Rear Footpeg Bracket Nuts	25	2.5	18	R

G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.

Exploded View



Exploded View

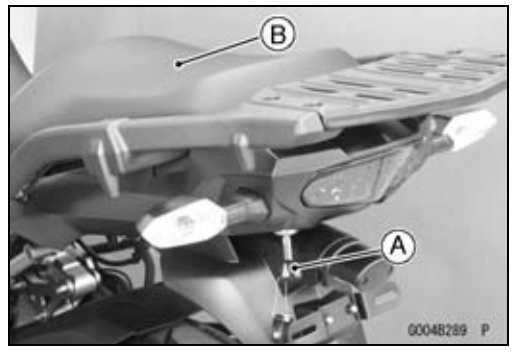
1. Other than GB WVTA (FULL H) and WVTA (78.2 H) Models
2. AU Model
3. CA Model

L: Apply a non-permanent locking agent.
R: Replacement Parts

Seats

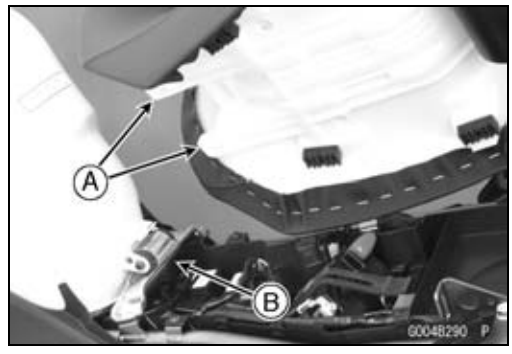
Seat Removal

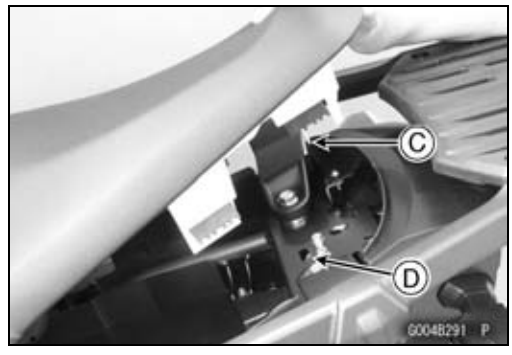
- Insert the ignition key [A] into the seat lock, turning the key clockwise, pulling up on the rear of the seat [B], and pull the seat forward.



Seat Installation

- Slip the seat hooks [A] under the brace [B] on the fuel tank bracket.
- Insert the seat hooks [C] into the latch hole [D].
- Push down the front part of the seat until the lock clicks.

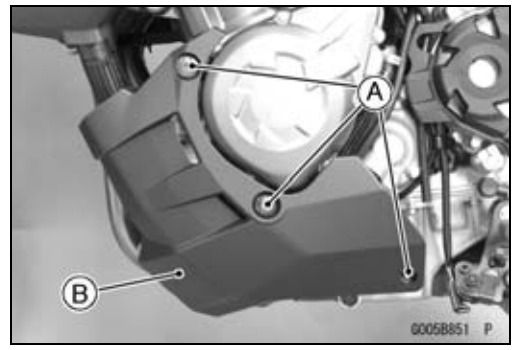




Fairings

Lower Fairing Removal

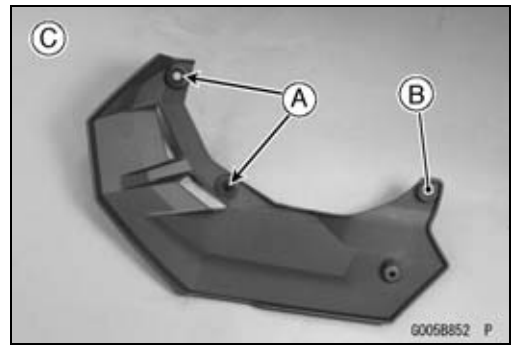
● Remove:
Bolts [A]
Lower Fairing [B]

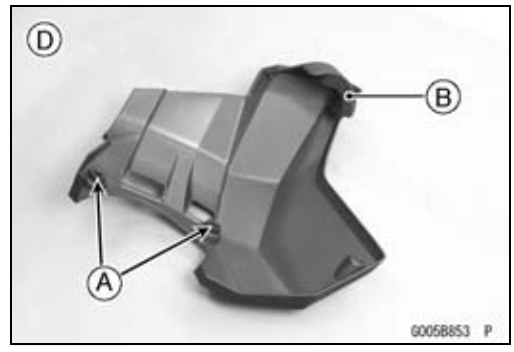


Lower Fairing Installation

● Installation is the reverse of removal, note the following.

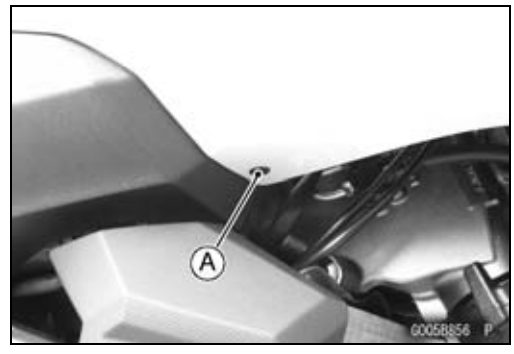
○Be sure install the grommets [A] and dampers [B].
Right Lower Fairing [C]
Left Lower Fairing [D]





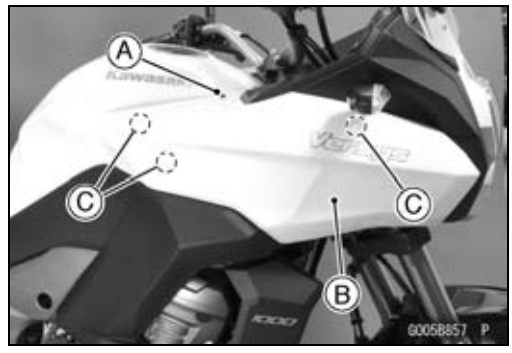
Middle Fairing Removal

● Remove:
Quick Rivet [A]



Fairings

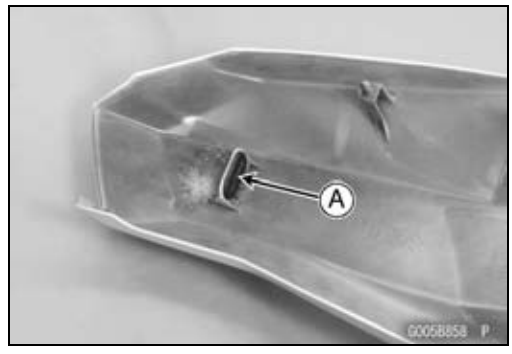
- Remove the bolt [A].
- Pull the middle fairing [B] evenly outward to clear the projections [C] and remove the fairing forward.



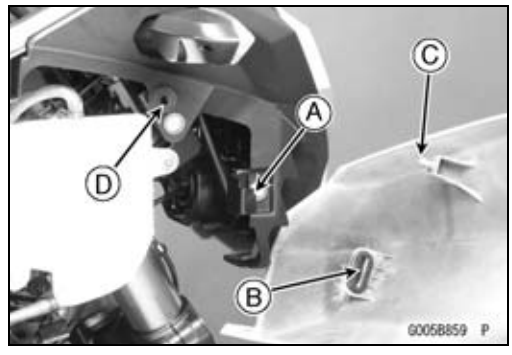
Middle Fairing Installation

- Installation is the reverse of removal, note the following.

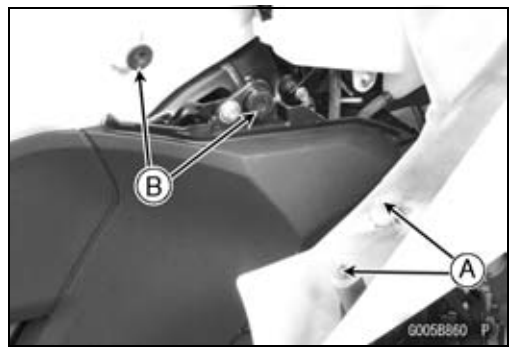
○Be sure install the grommet [A].



○Hang the hook portion [A] into the grommet [B].
○Insert the projection [C] into the grommet [D].

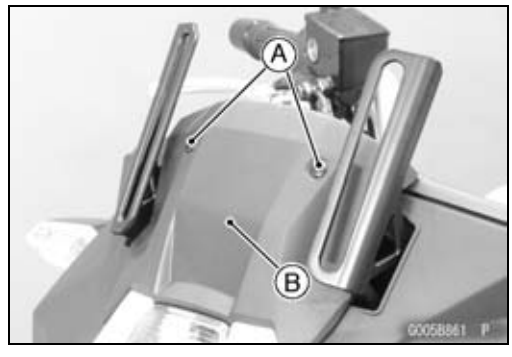


○Insert the projections [A] into the grommets [B].



Upper Fairing Removal

- Remove:
  Windshield Assembly (see Windshield Removal)
  Quick Rivets [A]
  Upper Fairing [B]



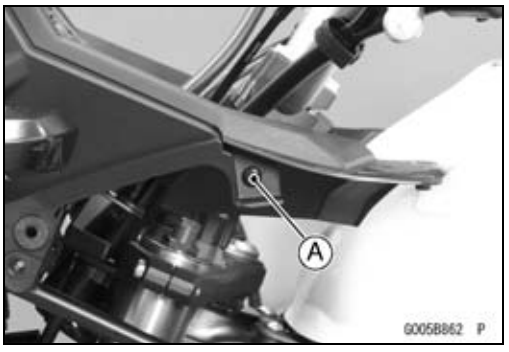
Upper Fairing Installation

- Installation is the reverse of removal.

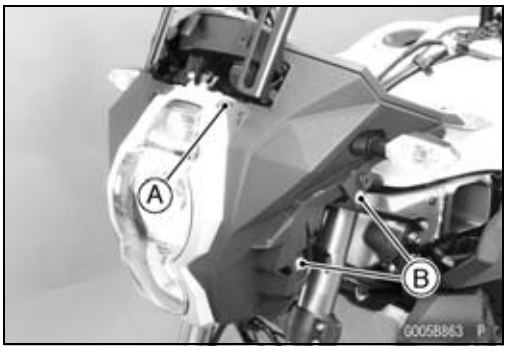
Fairings

Upper Side Fairing Removal

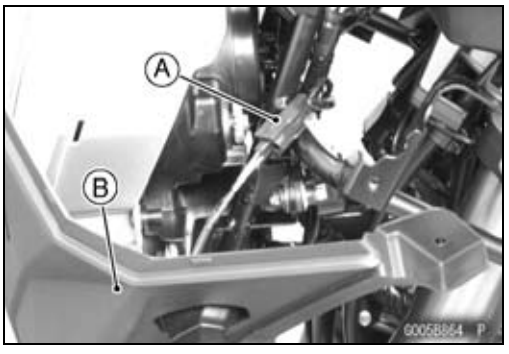
● Remove:
Middle Fairing (see Middle Fairing Removal)
Upper Fairing (see Upper Fairing Removal)
Quick Rivet [A]



● Remove:
Quick Rivet [A]
Bolts [B]

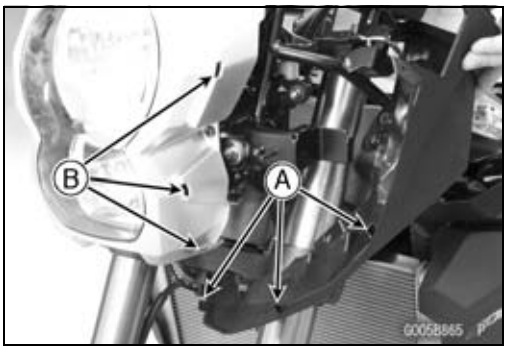


● Disconnect the turn signal light lead connector [A], and remove the upper side fairing [B].



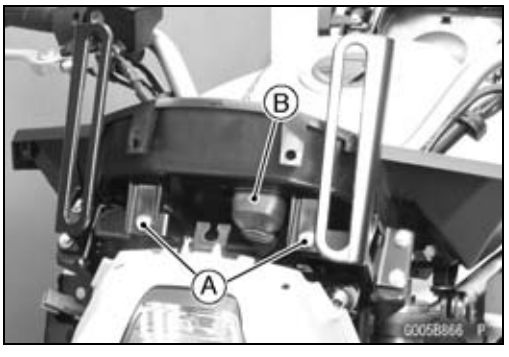
Upper Side Fairing Installation

● Installation is the reverse of removal, note the following.
○Insert the tabs [A] into the slots [B].



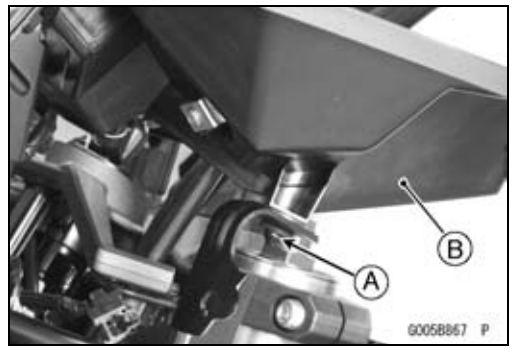
Meter Cover Removal

● Remove:
Upper Side Fairing (see Upper Side Fairing Removal)
Bolts [A]
● Slide the dust cover [B] and disconnect the connector.

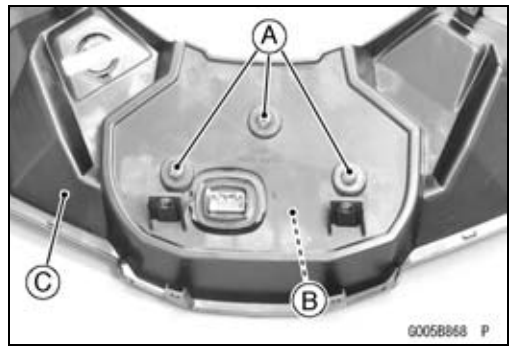


Fairings

- Clear the projection [A] (both sides) and remove the meter cover assembly [B].



- Remove:
  Screws [A] and Washers
  Meter Unit [B]
  Meter Cover [C]



NOTICE

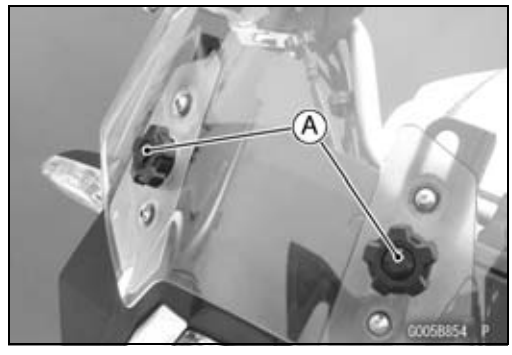
Place the meter unit so that the face is up. If a meter unit is left upside down or sideways for any length of time, it will malfunction.

Meter Cover Installation

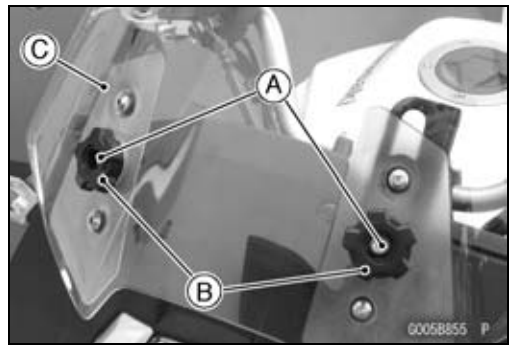
- Installation is the reverse of removal.

Windshield Removal

- Remove:
  Adjusting Nut Caps [A]

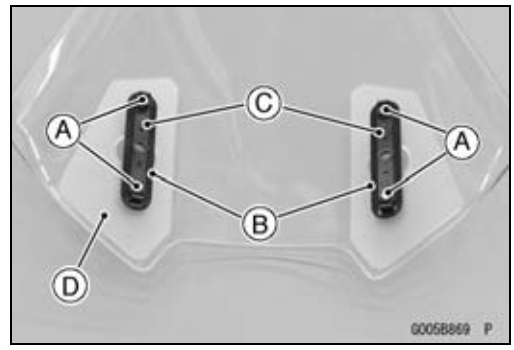


- Remove:
  Bolts [A] and Washers
  Adjusting Nuts [B], Bolts and Washers
  Windshield Assembly [C]



Fairings

● Remove:
Bolts [A]
Washers [B]
Brackets [C]
Windshield [D]

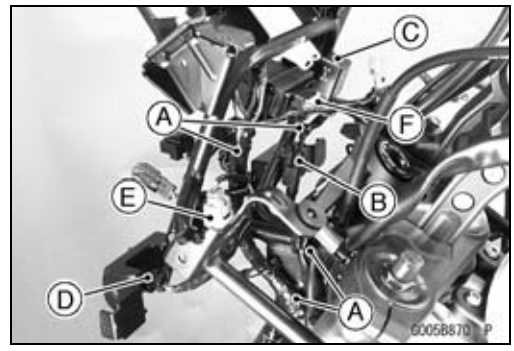


Windshield Installation

● Installation is reverse of removal.

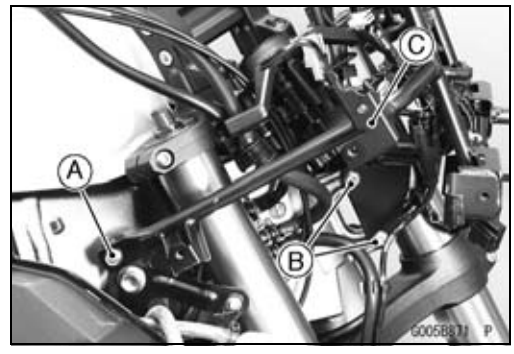
Upper Fairing Bracket Removal

● Remove:
Middle Fairing (see Middle Fairing Removal)
Upper Fairing (see Upper fairing Removal)
Upper Side Fairing (see Upper Side Fairing Removal)
Meter Cover (see Meter Cover Removal)
Coolant Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)
Bands [A]
Front Wheel Rotation Sensor [B]
Turn Signal Relay [C]



● Disconnect:
Outside Temperature Sensor [D]
Vehicle-down Sensor [E]
Immobilizer Amplifier [F] (Equipped Model)

● Remove:
Bolt [A] (Both Sides)
Bolts [B]
Upper Fairing Bracket [C]

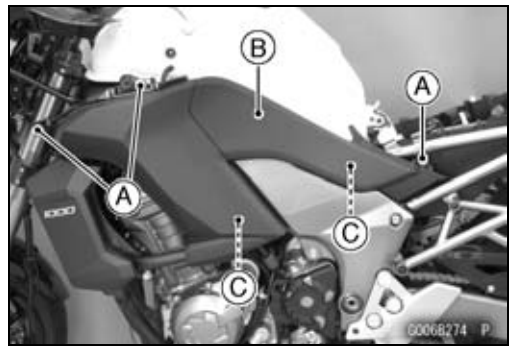


Upper Fairing Bracket Installation

● Installation is the reverse of removal, note the following.
○Run the cables and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

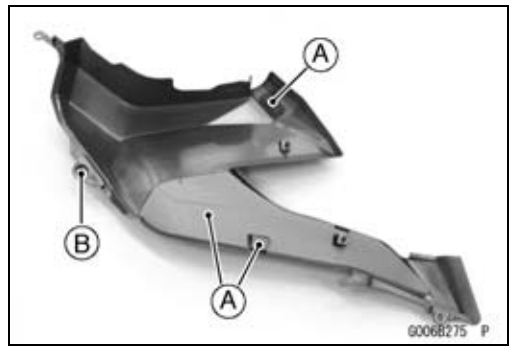
Side Covers

Side Cover Removal

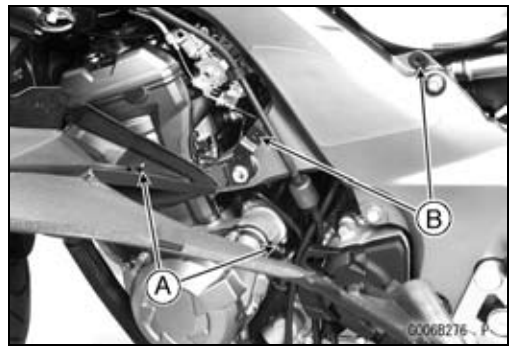


- Remove:
  Seat (see Seat Removal)
  Upper Side Fairing (see Upper Side Fairing Removal)
  Bolts [A] with Washers
- Pull the side cover [B] outward to clear the stoppers [C].

Side Cover Installation



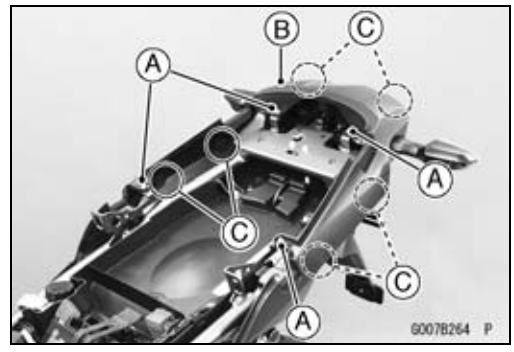
- Be sure to install the pads [A] and grommet [B].



- Insert the projections [A] into the holes [B].
- Install the bolts and washers.

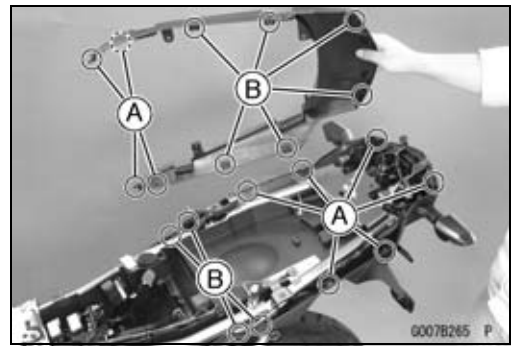
Seat Covers

Seat Cover Removal



- Remove:
  Seat (see Seat Removal)
  Carrier (see Carrier Removal)
  Bolts [A] and Washers
- Pull up the seat cover [B] to clear the hook portions [C] from the slots of the rear fender and remove it.

Seat Cover Installation

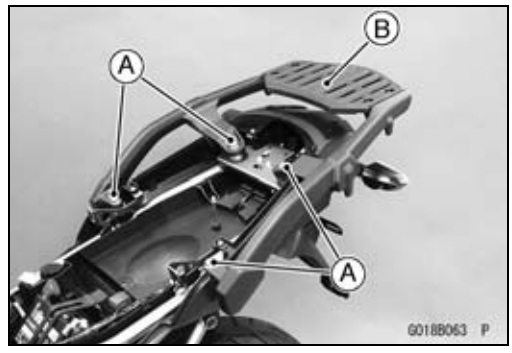


- Installation is the reverse of removal, note the following.

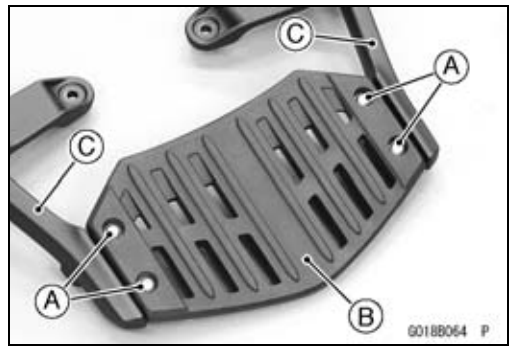
○Fit the craws [A] into the slits [B] on the rear fender.

Carrier

Carrier Removal



● Remove:
Seat (see Seat Removal)
Carrier Bracket Bolts [A] and Collars
Carrier Assembly [B]



● Remove:
Carrier Mounting Bolts [A] and Washers
Carrier [B]
Right and Left Carrier Brackets [C]

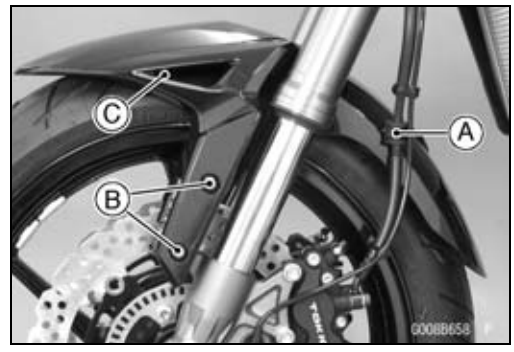
Carrier Installation

● Installation is the reverse of removal, note the following.
○Apply a non-parmanent locking agent to the thread of the carrier bracket bolts and carrier mounting bolts.
○Tighten:

Torque - Carrier Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Carrier Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

Fenders

Front Fender Removal



● Remove:
Brake Hose Clamp [A] (Both Sides)
Reflectors (Both Sides, AU and CA Models)
Bolts [B] with Washers (Both Sides)
Front Fender [C]

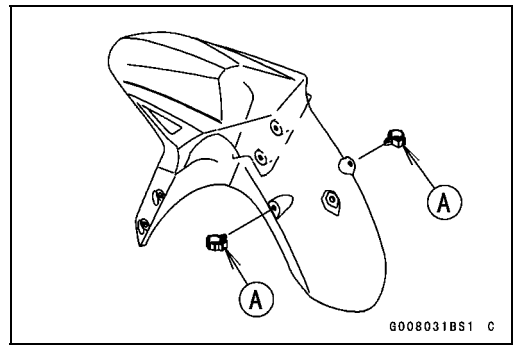
Front Fender Installation

● Installation is the reverse of removal, note the following.
○Install the front fender to the front fork.
○Tighten:

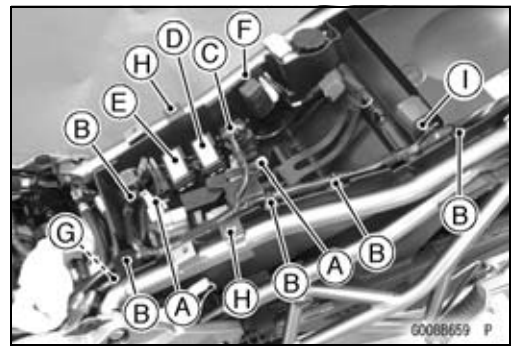
Torque - Front Fender Mounting Bolts: 3.9 N·m (0.40 kgf·m, 35 in·lb)

○Install the brake hose clamps to the front fender holes.

○Face the lock portion [A] of the brake hose clamp backward.



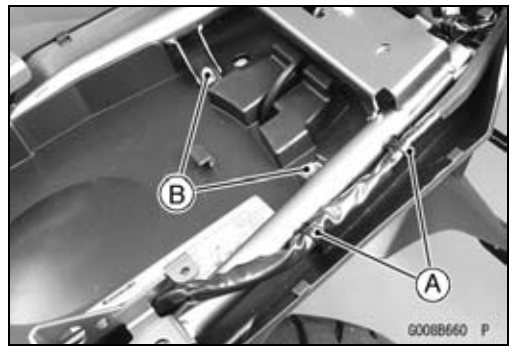
Flap and Rear Fender Removal



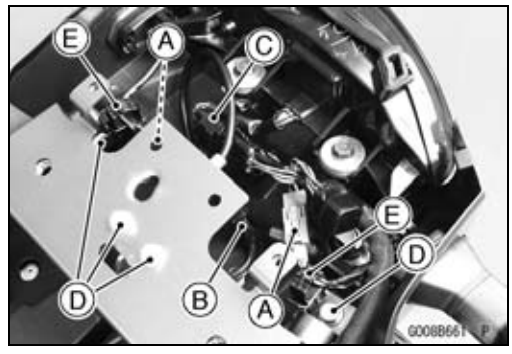
● Remove:
Seat (see Seat Removal)
Seat Cover (see Seat Cover Removal)
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
Battery (see Battery Removal in the Electrical System chapter)
ECU Guard (see Immobilizer System Parts Replacement in the Electrical System chapter, GB WVTA (FULL H) and WVTA (78.2 H) Models)
Screws [A]
Bands [B]
Starter Relay [C]
Fuse Box 1 [D]
Fuse Box 2 [E]
Bracket [F]
Clamp [G]
Bolts [H]
Immobilizer (Equipped Model)/Kawasaki Diagnostic System Connector [I]

Fenders

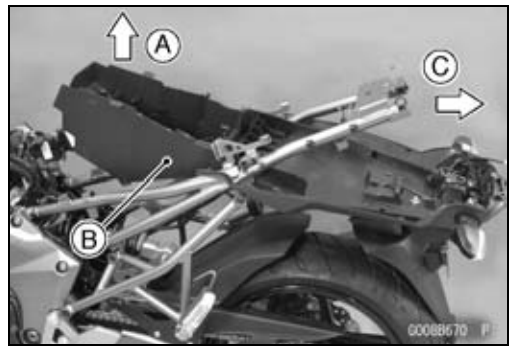
- Remove:
  Bands [A]
  Nuts [B]



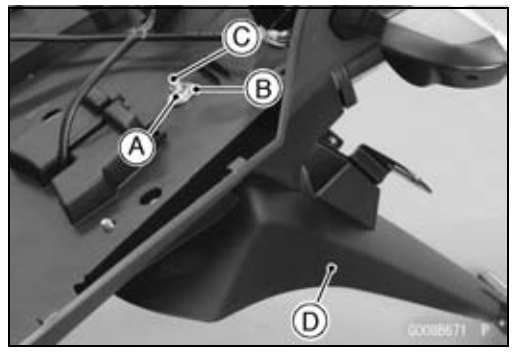
- Disconnect:
  Turn Signal Light Lead Connectors [A]
  Licence Plate Light Lead Connector [B]
  Tail Light Lead Connector [C]
- Remove:
  Bolts [D]
  Clamps [E]



- Pull up [A] front side of the rear fender [B], remove the rear fender rearward [C].



- Remove:
  Nut [A]
  Washer [B]
  Bolt [C]
  Flap [D]



Flap and Rear Fender Installation

- Installation is the reverse of removal, note the following.

○Replace the rear fender mounting nuts [A] with new ones.

○Run the cables, leads, harness and hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Frame

Frame Inspection

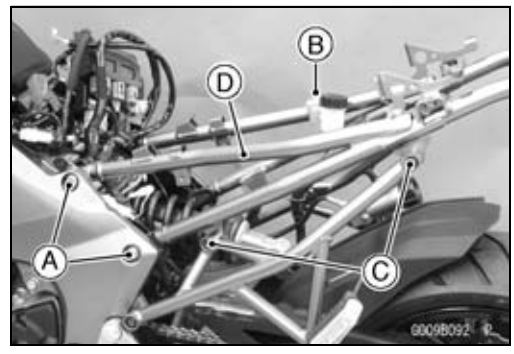
- Visually inspect the frame for cracks, dents, bending, or warp.

○If there is any damage to the frame, replace it.

⚠ WARNING

A repaired frame may fail in use, possibly causing an accident resulting in injury or death. If the frame is bent, dented, cracked, or warped, replace it.

Rear Frame Removal



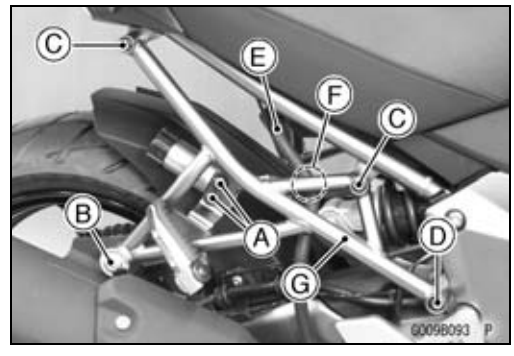
- Remove:
  Rear Fender (see Rear Fender Removal)
  Rear Frame Bolts [A] (Both Sides)
  Rear Master Cylinder Reservoir Bracket Bolt [B]
  Rear Footpeg Bracket Bolt Caps (Both Sides)
  Rear Footpeg Bracket Bolts (Upper) [C] and Nuts (Both Sides)
  Rear Frame [D]

Rear Frame Installation

- Replace the rear footpeg bracket nuts with new ones.
- Tighten:

Torque - Rear Frame Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)
Rear Footpeg Bracket Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Rear Footpeg Bracket Removal



- Remove:
  Rear Shockabsorber Adjuster Bolts [A] (Right Side Only)
  Muffler Body Mounting Bolt [B] and Washer
  Rear Footpeg Bracket Bolt Caps
  Rear Footpeg Bracket Bolts (Upper) [C] and Nuts
  Rear Footpeg Bracket Bolt (Lower) [D] and Washer
- Remove the brake hose [E] from the clamp [F] (Right Side Only).
- Remove the rear footpeg bracket [G].

Rear Footpeg Bracket Installation

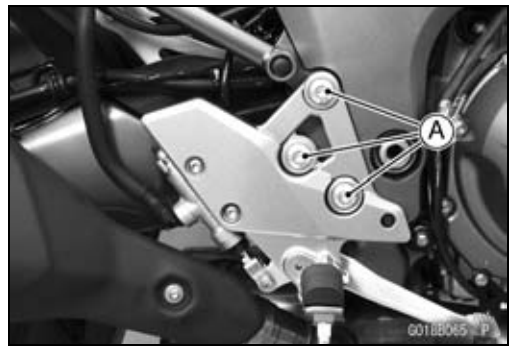
- Apply a non-parmanent locking agent to the thread of the rear footpeg bracket bolt (lower).
- Replace the rear footpeg bracket nuts with new ones.
- Tighten:

Torque - Rear Footpeg Bracket Bolts (Lower): 28 N·m (2.9 kgf·m, 21 ft·lb)
Rear Footpeg Bracket Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)

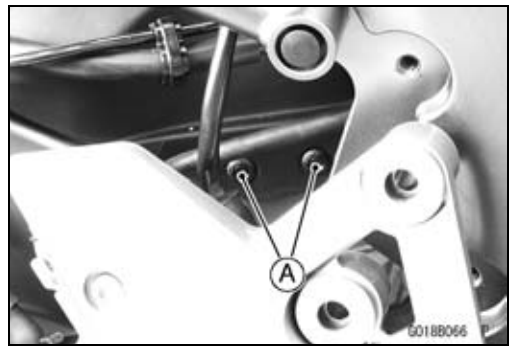
Guard

Upper Mud Guard Removal

● Remove:
Right Front Footpeg Bracket Bolts [A]

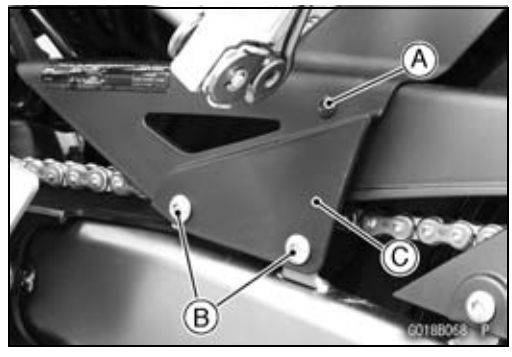


● Remove:
Quick Rivets [A]



● Remove:
Brake Hose Bracket Bolt [A]

● Remove:
Quick Rivet [A]
Upper Mud Guard Bolts [B]
Upper Mud Guard [C]



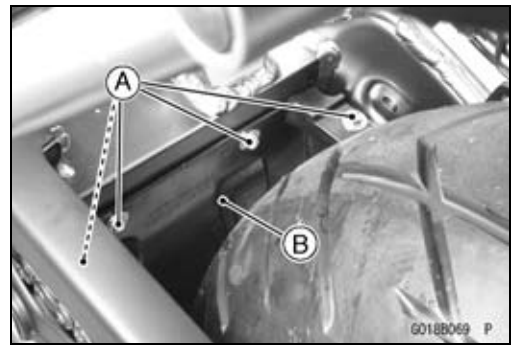
Upper Mud Guard Installation

● Installation is the reverse of removal, note the following.
○Apply a non-parmanent locking agent to the thread of the upper mud guard bolts and brake hose bracket bolt.
○Tighten:

Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

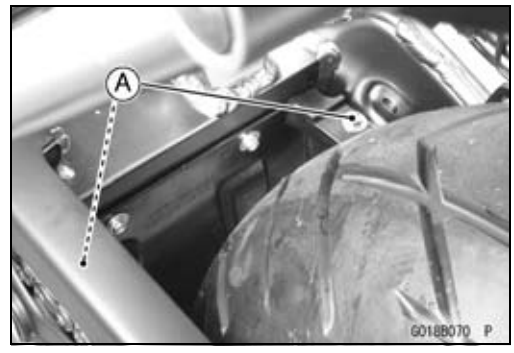
Guard

Lower Mud Guard Removal



● Remove:
Upper Mud Guard (see Upper Mud Guard Removal)
Lower Mud Guard Bolts [A]
Lower Mud Guard [B]

Lower Mud Guard Installation

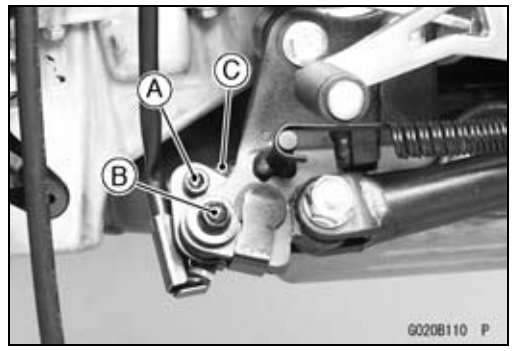


● Installation is the reverse of removal, note the following.
○Apply a non-parmanent locking agent to the thread of the two lower mud guard bolts [A].

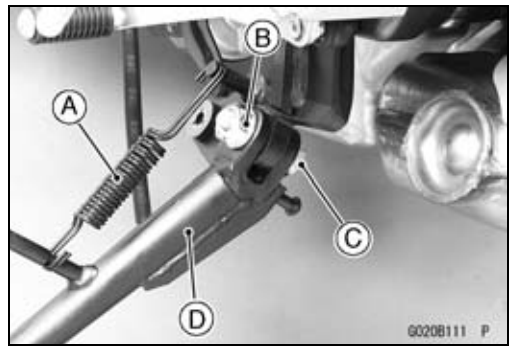
Sidestand

Sidestand Removal

- Raise the rear wheel off the ground with the stand.
- Remove:
  Sidestand Switch Bolt [A]
  Nut [B]
  Sidestand Switch [C]



- Remove:
  Spring [A]
  Sidestand Nut [B]
  Sidestand Bolt [C]
  Sidestand [D]



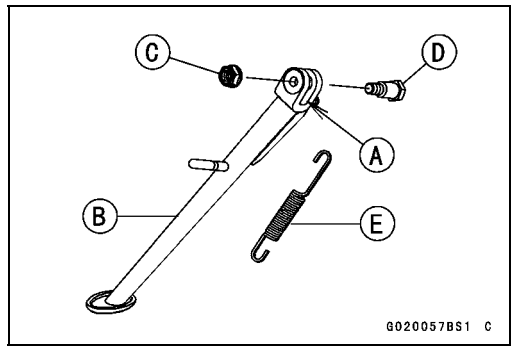
Sidestand Installation

- Apply grease to the sliding area [A] of the sidestand [B].
- Replace the sidestand nut [C] with a new one.
- Tighten the sidstand bolt [D] first, and then the sidestand nut.

Torque - Sidestand Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)
Sidestand Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Hook the spring [E] so that the long spring end faces upward.

○Install the spring hook direction as shown in the figure.

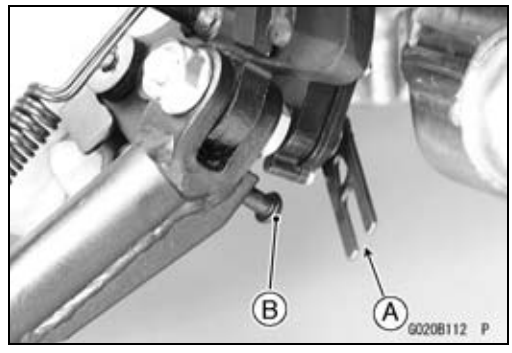


- Install the sidestand switch.

○Fit the slit [A] on the sidestand switch to the pin [B] on the sidestand.

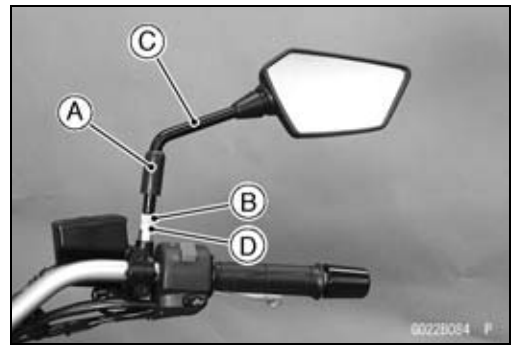
- Apply a non-permanent locking agent to the thread of the switch bolt, and tighten it.

Torque - Sidestand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)



Rear View Mirrors

Rear View Mirror Removal

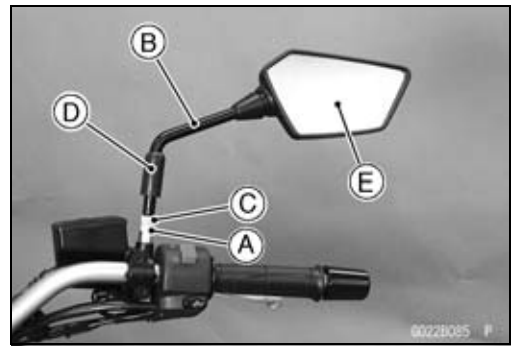


- Slide the dust cover [A].
- Loosen the rear view mirror locknut (upper) [B], and remove the rear view mirror stay [C] from the rear view mirror nut (lower) [D].

○The rear view mirror locknut (upper) and rear view mirror stay are left-hand thread.

- Loosen the rear view mirror nut (lower), and remove it.

Rear View Mirror Installation



- Tighten the rear view mirror nut (lower) [A].
- Tighten the rear view mirror stay [B] until the fully position.
- Adjust the rear view mirror stay to assure the safe conditions of the rear with the rider sitting on the motorcycle.

○The rear view mirror locknut (upper) and rear view mirror stay are left-hand thread.

- Tighten the rear view mirror locknut (upper) [C].
- Install the dust cover [D].
- Adjust the rear view mirror [E] by slightly moving only the mirror portion of the assembly.

○Installation and adjustment of the left side are common with those of the right side. Follow the procedure specified at the right side.

Electrical System

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Exploded View

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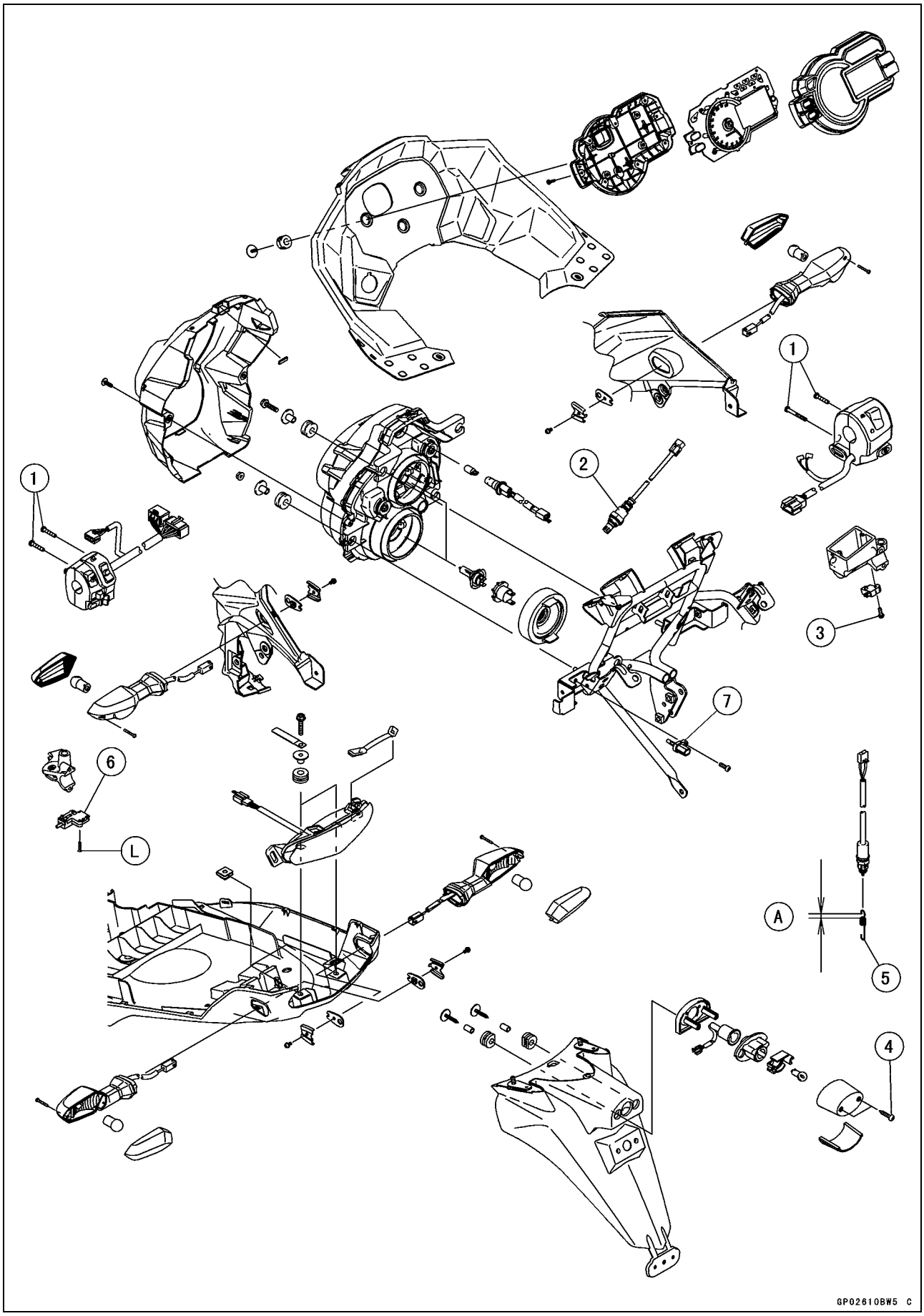
Exploded View



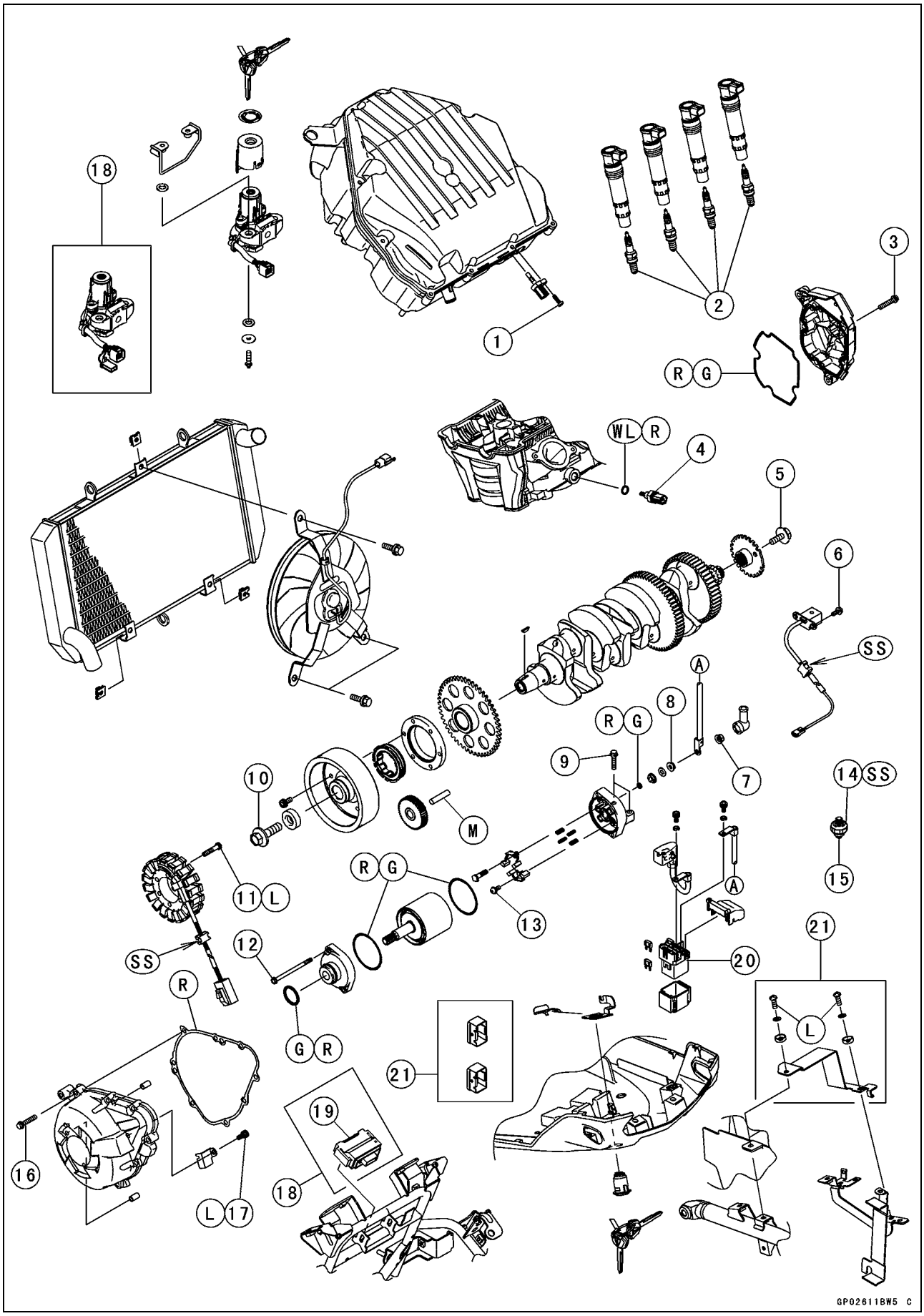
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Switch Housing Screws	3.5	0.36	31 in·lb	
2	Oxygen Sensor	44	4.5	32	
3	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
4	Licence Plate Light Mounting Screws	0.9	0.09	8 in·lb	

5. Install the rear brake light switch spring so that the shorter side [A] faces upward.
6. Starter Lockout Switch
7. Outside Temperature Sensor

L: Apply a non-permanent locking agent.

Exploded View



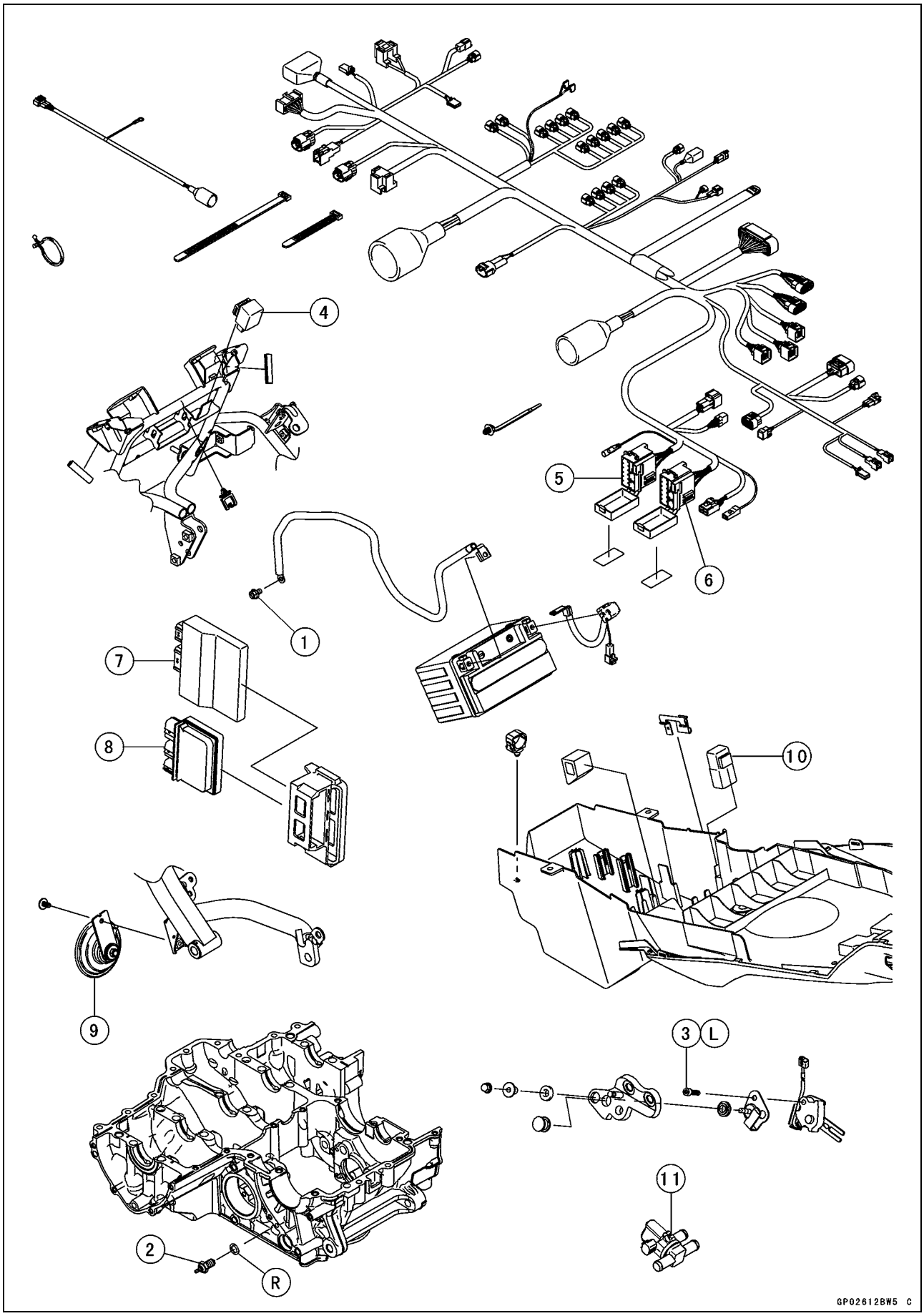
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Intake Air Temperature Sensor Mounting Screw	1.2	0.12	11 in·ib	
2	Spark Plugs	9.8	1.0	87 in·lb	
3	Crankshaft Sensor Cover Bolts	12	1.2	106 in·lb	
4	Water Temperature Sensor	12	1.2	106 in·lb	
5	Timing Rotor Bolt	39	4.0	29	
6	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
7	Starter Motor Cable Terminal Nut	5.9	0.60	52 in·lb	
8	Starter Motor Terminal Locknut	11	1.1	97 in·lb	
9	Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	
10	Alternator Rotor Bolt	155	15.8	114	
11	Stator Coil Bolts	12	1.2	106 in·ib	L
12	Starter Motor Through Bolts	5.0	0.51	44 in·lb	
13	Brush Holder Screw	3.8	0.39	34 in·ib	
14	Oil Pressure Switch	15	1.5	11	SS
15	Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·ib	
16	Alternator Cover Bolts	12	1.2	106 in·lb	
17	Alternator Lead Holding Plate Bolt	12	1.2	106 in·ib	L

18. Immobilizer Model
19. Immobilizer Amplifier
20. Starter Relay
21. WVTA (78.2H) and GB WVTA (FULL H) Models

G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
SS: Apply silicone sealant.
WL: Apply soap and water solution or rubber lubricant.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
2	Neutral Switch	15	1.5	11	
3	Sidestand Switch Bolt	8.8	0.90	78 in·lb	L

4. Turn Signal Relay
5. Fuel Box 1
6. Fuel Box 2
7. ECU
8. Relay Box
9. Horn
10. Accessory Relay
11. Air Switching Valve

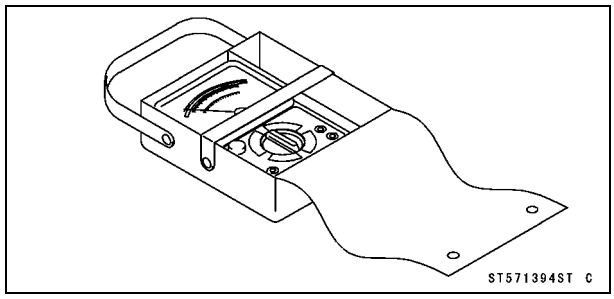
L: Apply a non-permanent locking agent.
R: Replacement Parts

Specifications

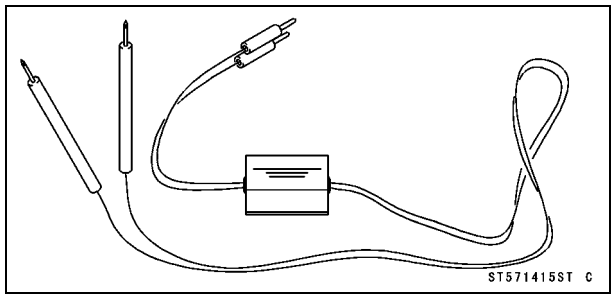
Item	Standard
Battery	
Type	Sealed Battery
Model Name	YTX9-BS
Capacity	12 V 8 Ah
Voltage	12.8 V or more
Charging System	
Type	Three-phase AC
Alternator Output Voltage	44.8 V or more at 4 000 rpm
Stator Coil Resistance	0.17 ~ 0.25 Ω at 20°C (68°F)
Charging Voltage (Regulator/Rectifier Output Voltage)	14.4 ~ 15.0 V
Ignition System	
Crankshaft Sensor Resistance	376 ~ 564 Ω
Crankshaft Sensor Peak Voltage	2.0 V or more
Stick Coil:	
Primary Winding Resistance	1.1 ~ 1.5 Ω
Secondary Winding Resistance	10.8 ~ 16.2 kΩ
Primary Peak Voltage	100 V or more
Spark Plug:	
Type	NGK CR9EIA-9
Gap	0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)
Electric Starter System	
Starter Motor:	
Brush Length	12 mm (0.47 in.) [Service limit: 6.5 mm, 0.26 in.]
Air Switching Valve	
Resistance	18 ~ 22 Ω at 20°C (68°F)
Switches and Sensors	
Rear Brake Light Switch Timing	ON after about 10 mm (0.39 in.) pedal travel
Engine Oil Pressure Switch Connections	When engine is stopped: ON When engine is running: OFF
Water Temperature Sensor Resistance	in the text
Outside Temperature Sensor Resistance	5.4 ~ 6.6 kΩ at 0°C (32°F) 0.29 ~ 0.39 kΩ at 80°C (176°F)
Fuel Level Sensor Resistance:	
Full Position	9.6 ~ 12.4 Ω
Empty Position	222 ~ 228 Ω

Special Tools and Sealant

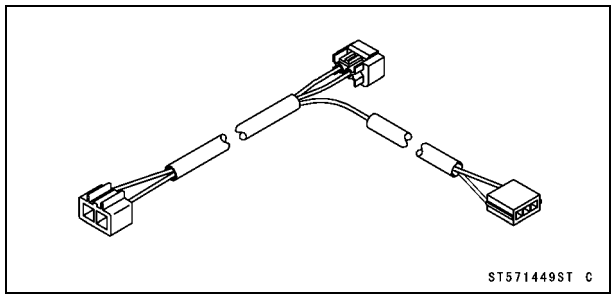
Hand Tester:
57001-1394



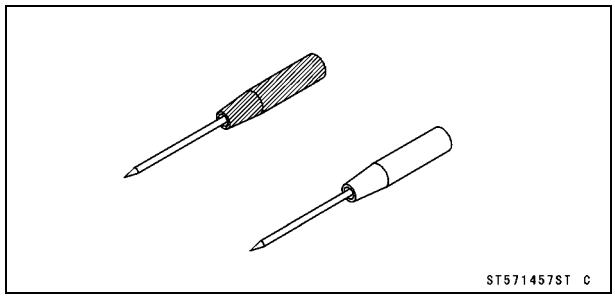
Peak Voltage Adapter:
57001-1415



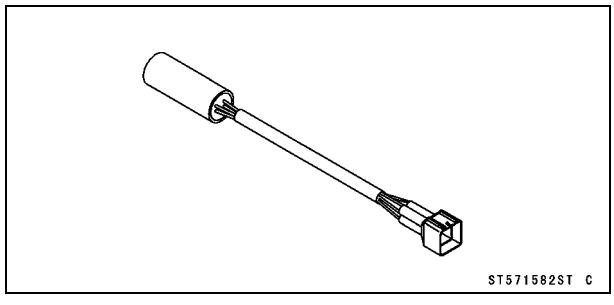
Lead Wire - Peak Voltage Adapter:
57001-1449



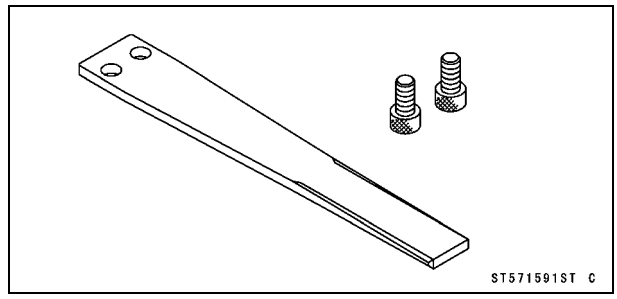
Needle Adapter Set:
57001-1457



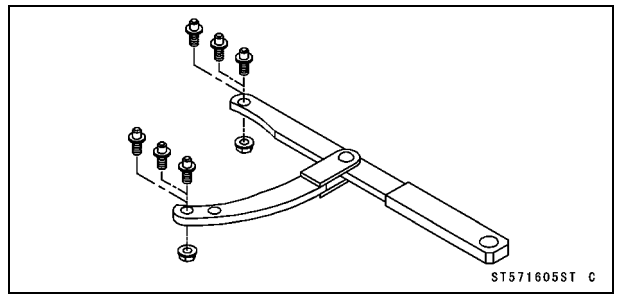
Key Registration Unit:
57001-1582



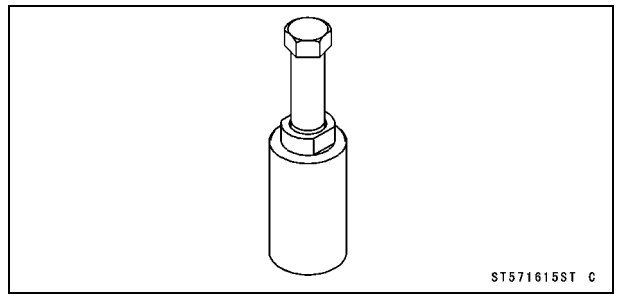
Grip:
57001-1591



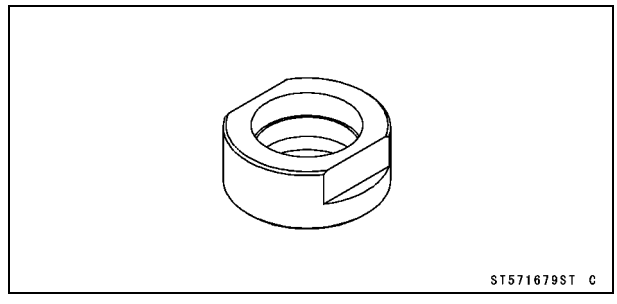
Flywheel & Pulley Holder:
57001-1605



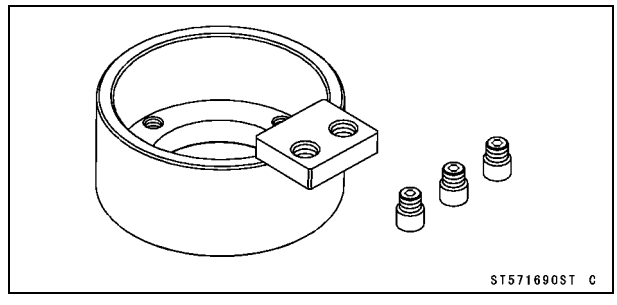
Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:
57001-1615



Stopper:
57001-1679

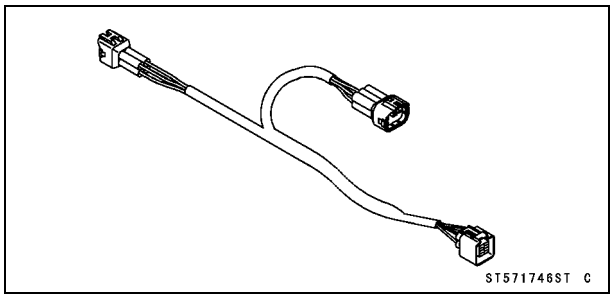


Rotor Holder:
57001-1690

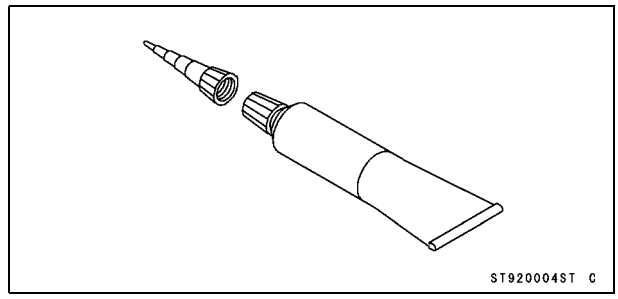


Special Tools and Sealant

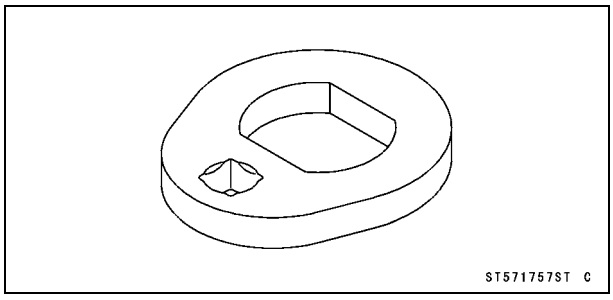
Key Registration Adapter:
57001-1746



Liquid Gasket, TB1211F:
92104-0004

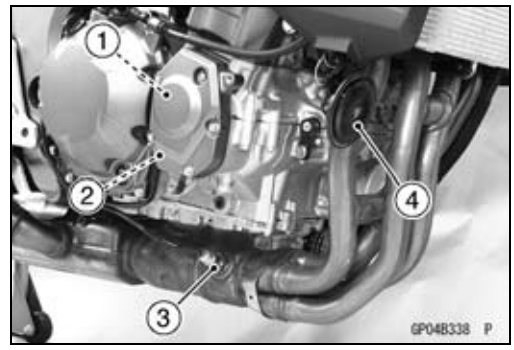


Rotor Holder:
57001-1757

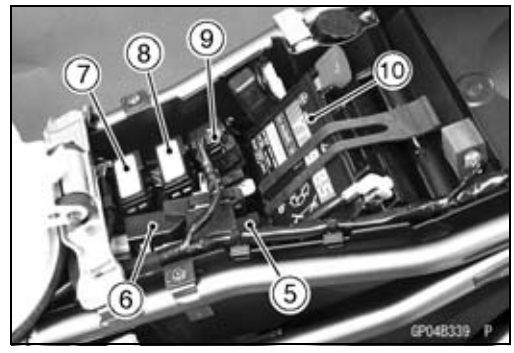


Parts Location

1. Timing Rotor
2. Crankshaft Sensor
3. Oxygen Sensor
4. Horn



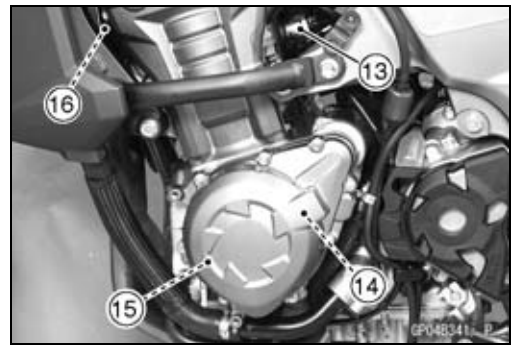
5. Relay Box
6. ECU
7. Fuse Box 1
8. Fuse Box 2
9. Starter Relay
10. Battery 12 V 8 Ah



11. Rear Brake Light Switch

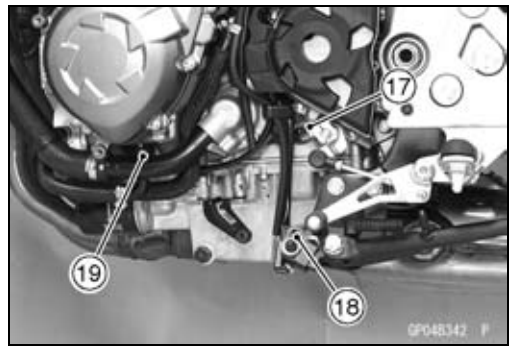
12. Regulator/Rectifier

13. Water Temperature Sensor
14. Alternator
15. Stator Coil
16. Radiator Fan Motor

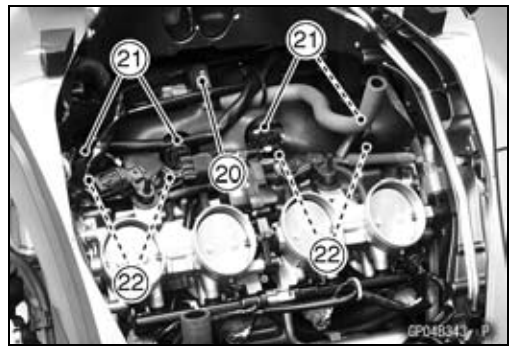


Parts Location

17. Neutral Switch
18. Sidestand Switch
19. Oil Pressure Switch

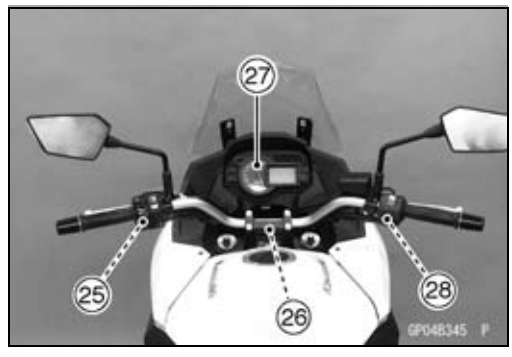


20. Air Switching Valve
21. Stick Coils
22. Spark Plugs



23. Immobilizer Amplifier (Equipped Models)
24. Turn Signal Relay

25. Starter Lockout Switch
26. Ignition Switch
    (Immobilizer Equipped Model: Including Immobilizer Antenna)
27. Meter Unit
28. Front Brake Light Switch



29. Rear Wheel Rotation Sensor

Wiring Diagram (BR Model)

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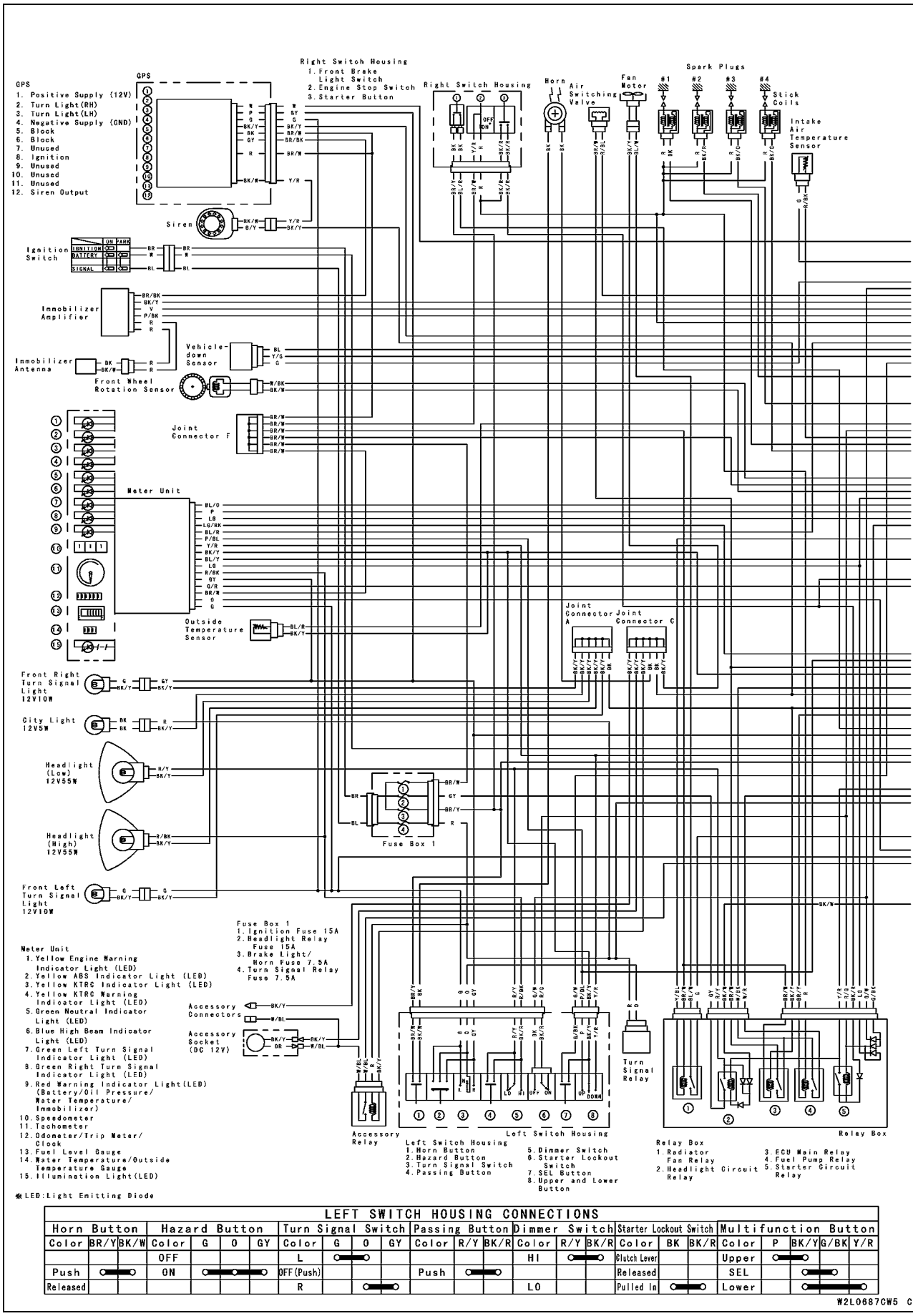
Wiring Diagram (BR Model)

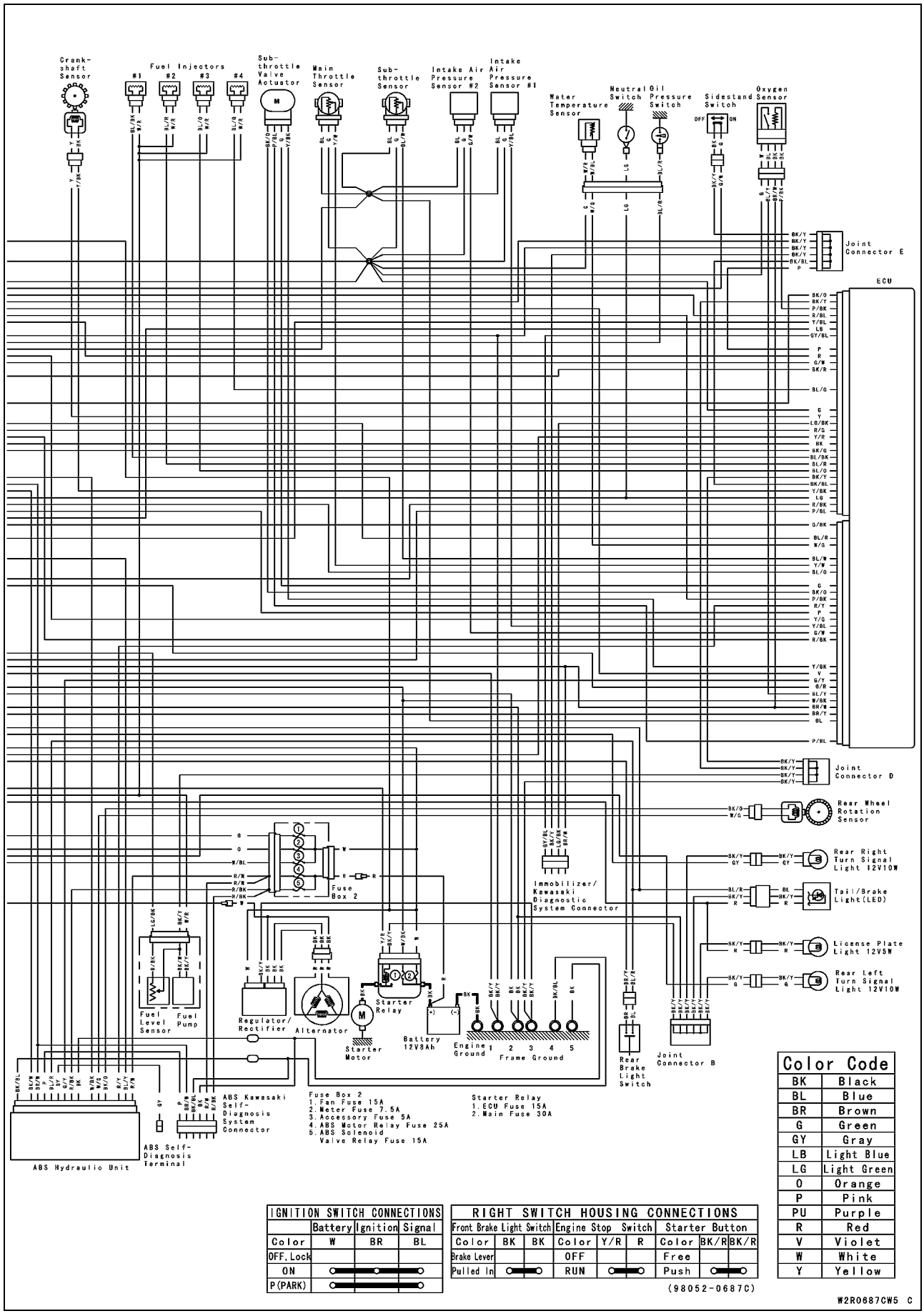


LEFT SWITCH HOUSING CONNECTIONS

Horn Button			Hazard Button				Turn Signal Switch				Passing Button			Dimmer Switch			Starter Lockout Switch			Multifunction Button				
Color	BR/Y	BK/W	Color	G	O	GY	Color	G	O	GY	Color	R/Y	BK/R	Color	R/Y	BK/R	Color	BK	BK/R	Color	P	BK/Y	G/BK	Y/R
			OFF				L	○	●					HI	○	●	Clutch Lever			Upper	○	●		
Push	○	●	ON	○	●	●	OFF(Push)			●	Push	○	●				Released			SEL		○	●	
Released							R		○	●				LO			Pulled In	○	●	Lower		○	●	●

W2L0687CW5 C

Wiring Diagram (BR Model)



IGNITION SWITCH CONNECTIONS			
	Battery	Ignition	Signal
Color	W	BR	BL
OFF, Lock			
ON	●	●	●
P(PARK)	●		●

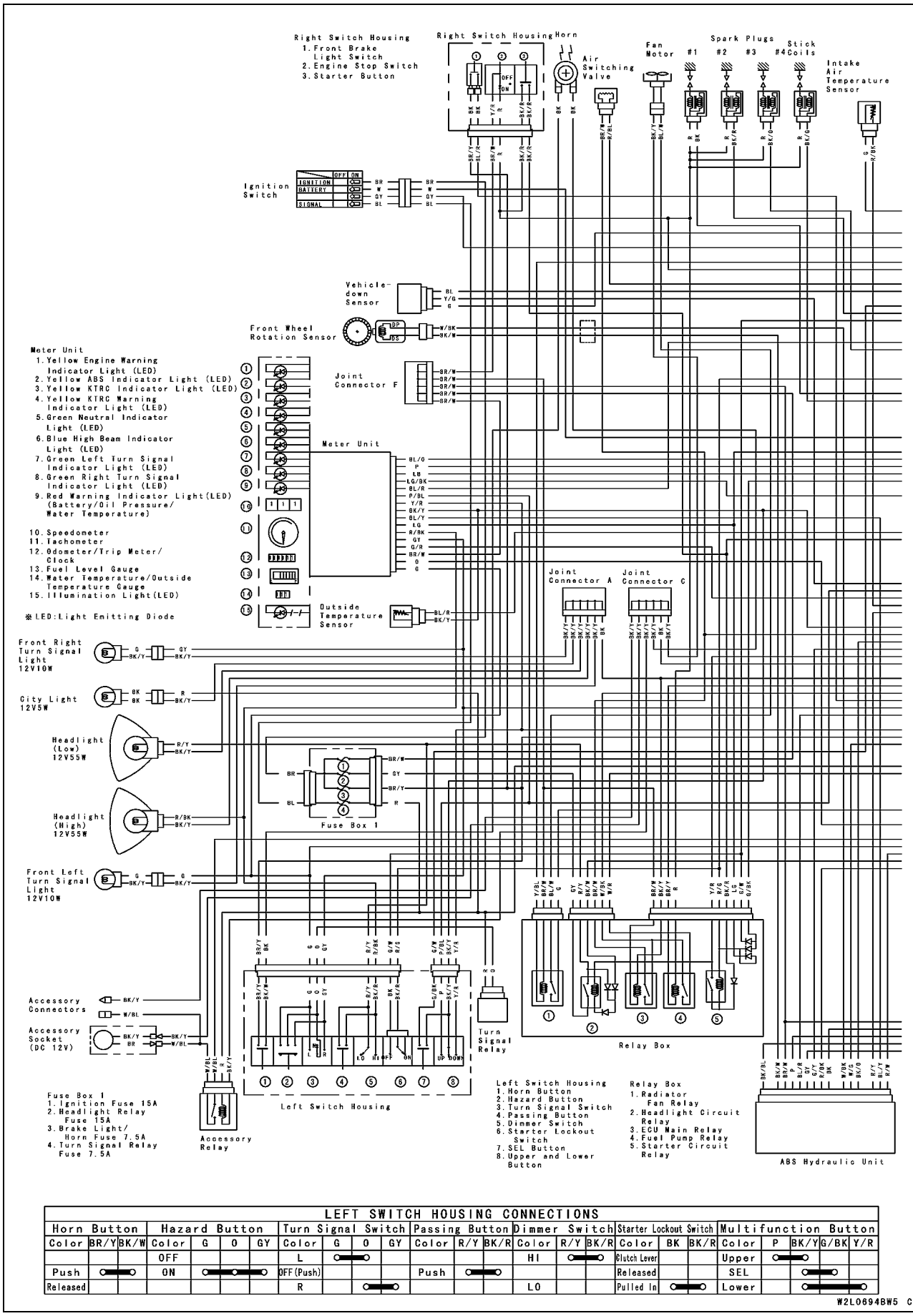
RIGHT SWITCH HOUSING CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	Y/R	R	Color	BK/R	BK/R
Brake Lever			OFF			Free		
Pulled In	●		RUN	●		Push	●	

Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
V	Violet
W	White
Y	Yellow

(98052-0687C)

W2R0687CW5 C

Wiring Diagram (CA Model)

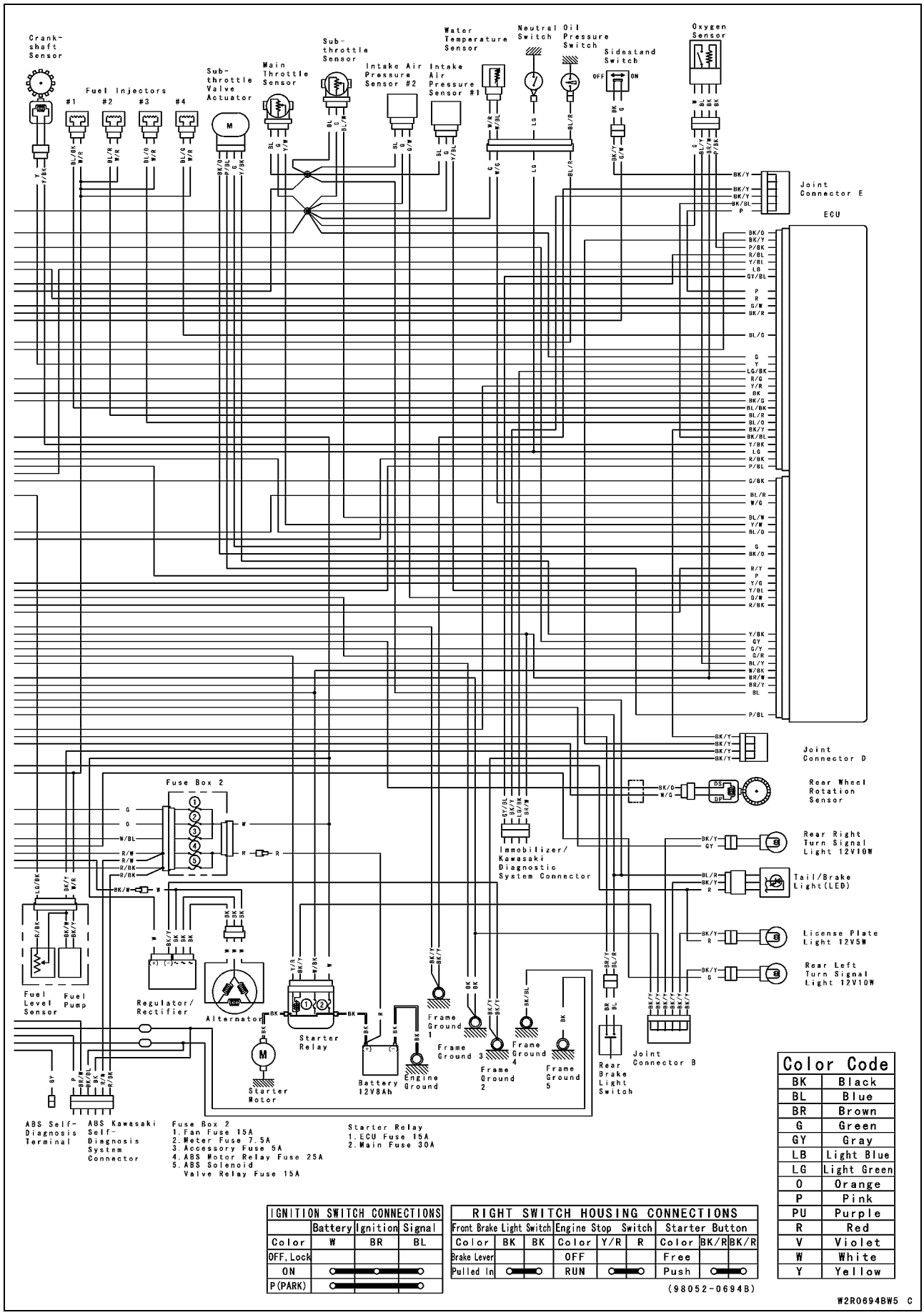


LEFT SWITCH HOUSING CONNECTIONS

Horn Button			Hazard Button				Turn Signal Switch				Passing Button			Dimmer Switch			Starter Lockout Switch			Multifunction Button				
Color	BR/Y	BK/W	Color	G	O	GY	Color	G	O	GY	Color	R/Y	BK/R	Color	R/Y	BK/R	Color	BK	BK/R	Color	P	BK/Y	G/BK	Y/R
			OFF				L	○	●					HI	○	●	Clutch Lever			Upper	●			
Push	○	●	ON	○	●	●	OFF (Push)				Push	○	●				Released			SEL		○	●	
Released							R		●	○				LO			Pulled In	○	●	Lower		○	●	●

W2L0694BW5 C

Wiring Diagram (CA Model)



Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
V	Violet
W	White
Y	Yellow

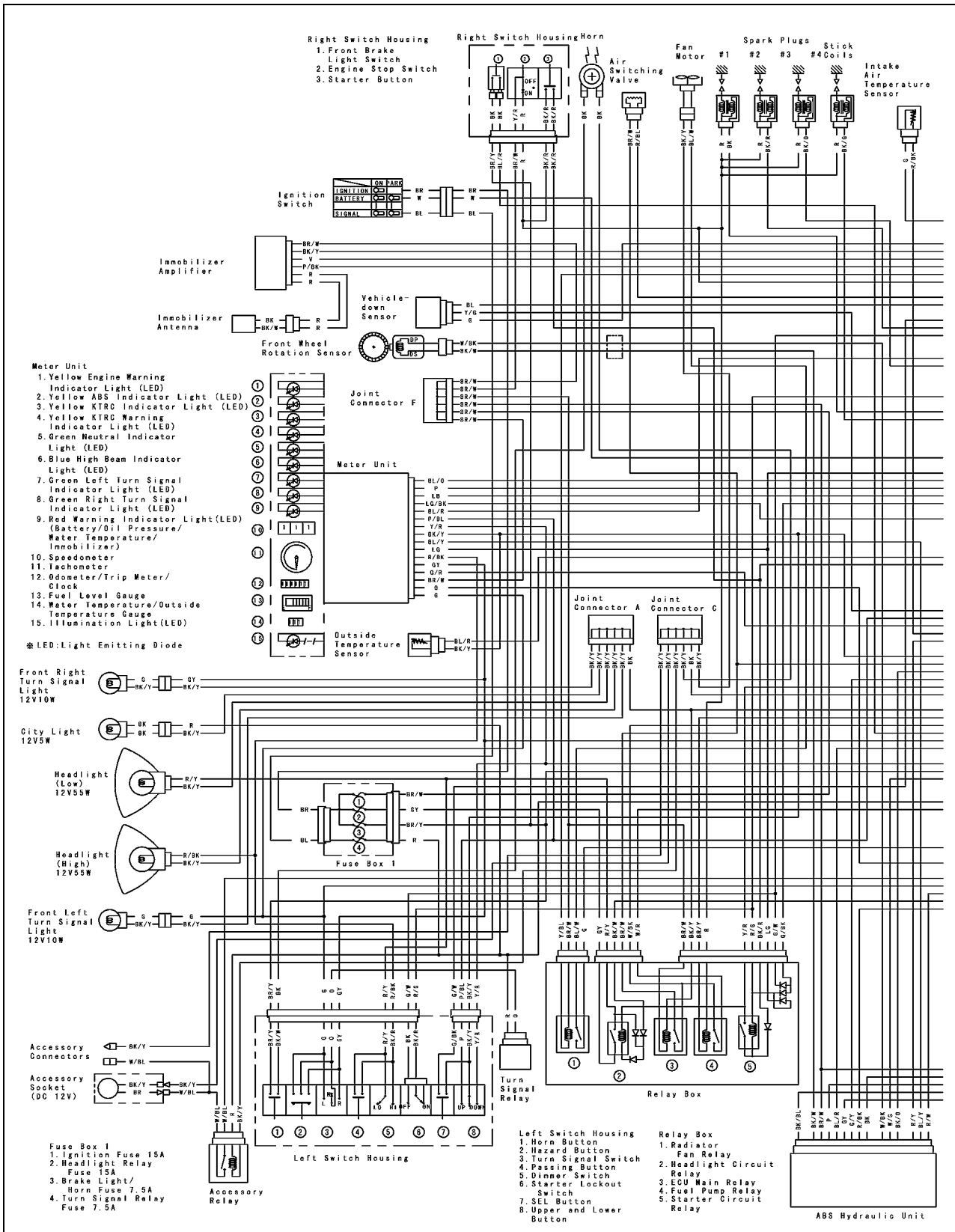
IGNITION SWITCH CONNECTIONS			
	Battery	Ignition	Signal
Color	W	BR	BL
OFF, Lock			
ON	●	●	●
P(PARK)	●		●

RIGHT SWITCH HOUSING CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	Y/R	R	Color	BK/R	BK/R
Brake Lever			OFF			Free		
Pulled In	●		RUN	●		Push	●	

(98052-0694B)

W2R0694BW5 C

Wiring Diagram (Other than BR and CA Models)

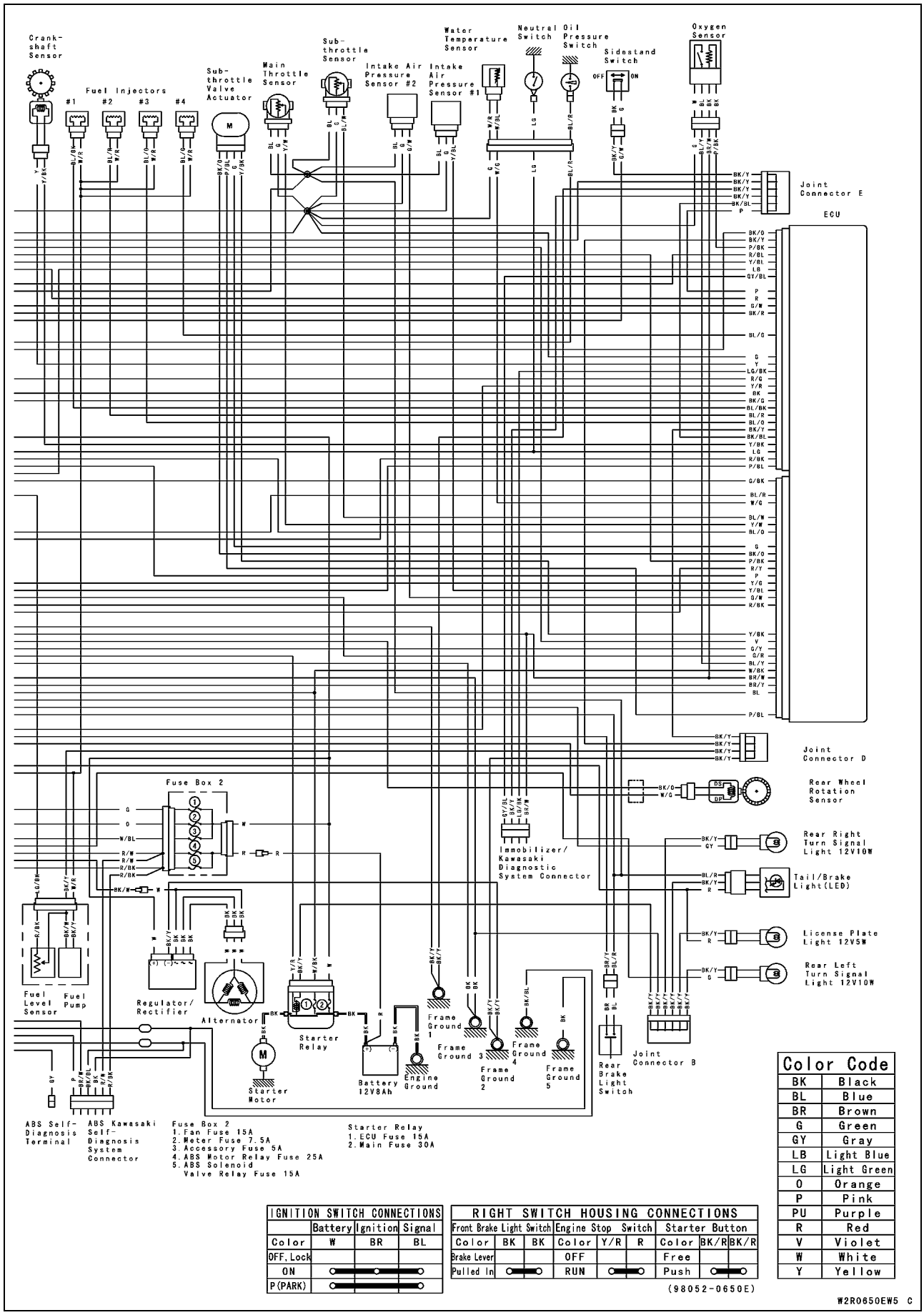


LEFT SWITCH HOUSING CONNECTIONS

Horn Button			Hazard Button				Turn Signal Switch				Passing Button			Dimmer Switch			Starter Lockout Switch			Multifunction Button				
Color	BR/Y	BK/W	Color	G	O	GY	Color	G	O	GY	Color	R/Y	BK/R	Color	R/Y	BK/R	Color	BK	BK/R	Color	P	BK/Y	G/BK	Y/R
			OFF				L							HI			Clutch Lever			Upper				
Push			ON				OFF (Push)				Push						Released			SEL				
Released							R							LO			Pulled In			Lower				

W2L0650EW5 C

Wiring Diagram (Other than BR and CA Models)



Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
V	Violet
W	White
Y	Yellow

IGNITION SWITCH CONNECTIONS			
	Battery	Ignition	Signal
Color	W	BR	BL
OFF, Lock			
ON		●	●
P(PARK)	●		●

RIGHT SWITCH HOUSING CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	Y/R	R	Color	BK/R	BK/R
Brake Lever			OFF			Free		
Pulled In	●	●	RUN	●	●	Push	●	●

(98052-0650E)

W2R0650EW5 C

Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Take care not to short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

Electrical Wiring

Wiring Inspection

- Visually inspect the wiring for signs of burning, fraying, etc.

★If any wiring is poor, replace the damaged wiring.

- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.

★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.

- Check the wiring for continuity.

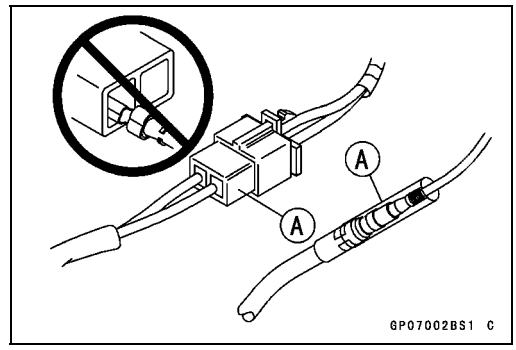
○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

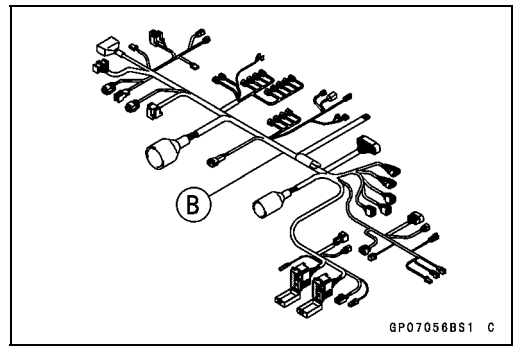
○Connect the hand tester between the ends of the leads.

Special Tool - Hand Tester: 57001-1394

○Set the tester to the × 1 Ω range, and read the tester.

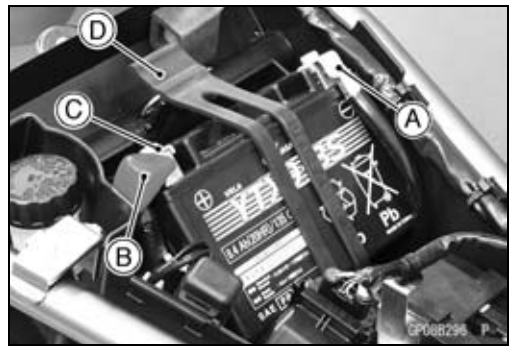
★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the wiring harness [B] if necessary.





Battery

Battery Removal



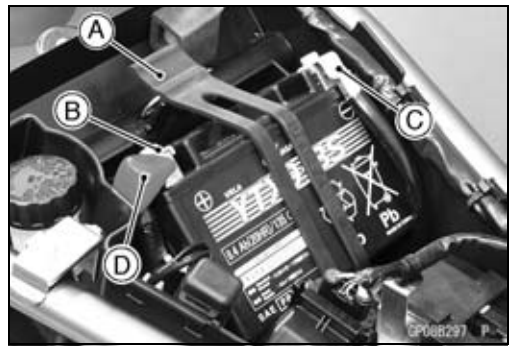
- Turn the ignition switch to OFF.
- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Disconnect the negative (–) cable [A].

NOTICE

Be sure to disconnect the negative (–) cable first.

- Slide out the positive (+) terminal cap [B] and disconnect the positive (+) cable [C].
- Remove the band [D] and the battery.

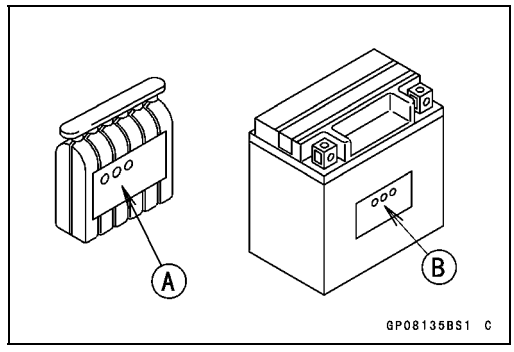
Battery Installation



- Turn the ignition switch to OFF.
- Put the battery into the rear fender.
- Install the band [A].
- Connect the positive (+) cable [B] (red cap) to the positive (+) terminal first, and then the negative (–) cable [C] to the negative (–) terminal.
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the Positive (+) terminal with the cap [D].

Battery Activation

Electrolyte Filling



- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

Battery Model Name

KLZ1000A: YTX9-BS

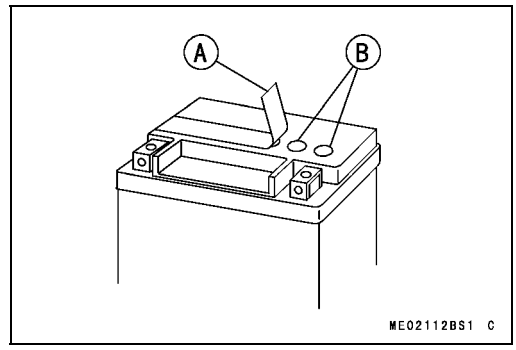
NOTICE

Each battery comes with its own specific electrolyte container; using the wrong container may overfill the battery with incorrect electrolyte, which can shorten battery life and deteriorate battery performance. Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type.

Battery

NOTICE

Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.



⚠ DANGER

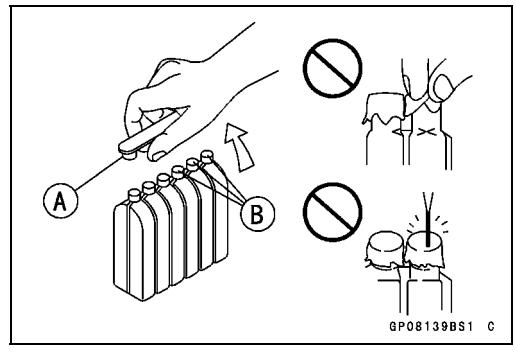
Sulfuric acid in battery electrolyte can cause severe burns. To prevent burns, wear protective clothing and safety glasses when handling electrolyte. If the electrolyte comes in contact with your skin or eyes, wash the area with liberal amounts of water and seek medical attention for more severe burns.

- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

NOTE

○*The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*

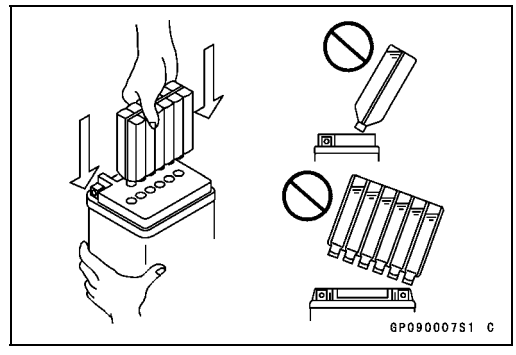
- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.



NOTE

○*Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*

- Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.



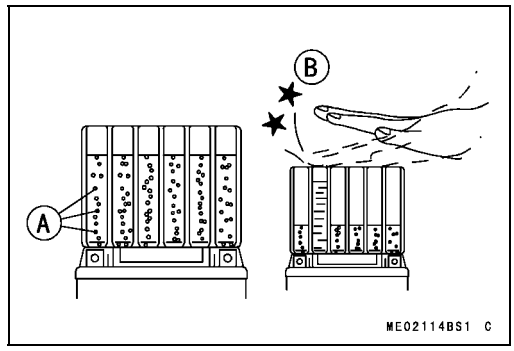
NOTE

○*Do not tilt the electrolyte container.*

Battery

● Check the electrolyte flow.

★If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.



NOTE

○*Be careful not to have the battery fall down.*

● Keep the container in place. Don't remove the container from the battery, the battery requires all the electrolyte from the container for proper operation.

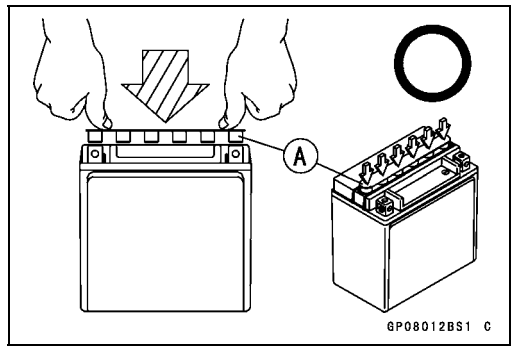
NOTICE

Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the container until it is completely empty.

● After filling, let the battery sit for 20 ~ 60 minutes with the electrolyte container kept in place, which is required for the electrolyte to fully permeate into the plates.

● Make sure that the container cells have emptied completely, and remove the container from the battery.

● Place the strip of caps [A] loosely over the filler ports, press down firmly with both hands to seat the strip of caps into the battery (don't pound or hammer). When properly installed, the strip of caps will be level with the top of the battery.

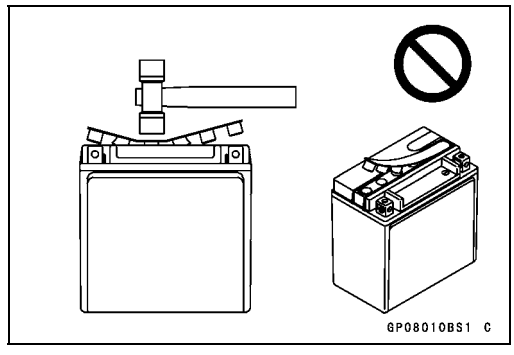


NOTICE

Once the strip of caps is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.

NOTE

○*Charging the battery immediately after filling can shorten service life.*



Battery

Initial Charge

● Newly activated sealed batteries require an initial charge.

Standard Charge: 0.9 A × 5 ~ 10 hours

★If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

Kawasaki-recommended chargers:
Battery Mate 150-9
OptiMate PRO 4-S/PRO S/PRO2
Yuasa MB-2040/2060
Christie C10122S

★If the above chargers are not available, use equivalent one.

● Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. (Voltage immediately after charging becomes temporarily high. For accurate measuring, let the battery sit for given time.)

NOTE

○*Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. If voltage is not at least 12.8 V, repeat charging cycle.*

○*To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds.*
Re-check voltage and if less than 12.8 V repeat the charging cycle and load test. If still below 12.8 V the battery is defective.

Precautions

1) No need of topping-up
No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.

2) Refreshing charge.
If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see Refreshing Charge).
When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

NOTICE

This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge.
If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.

3) When you do not use the motorcycle for months.
Give a refresh charge before you store the motorcycle and store it with the negative cable removed. Give a refresh charge **once a month** during storage.

4) Battery life.
If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

Battery

⚠ DANGER

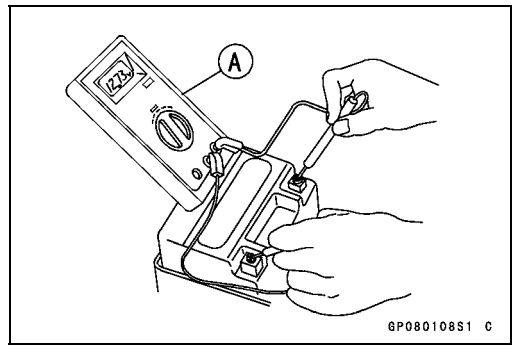
Batteries produce an explosive gas mixture of hydrogen and oxygen that can cause serious injury and burns if ignited. Keep the battery away from sparks and open flames during charging. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases. The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water and seek medial attention for more severe burns.

Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

Charging Condition Inspection



○Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].

● Remove:
Seats (see Seats section in the Frame chapter)

● Disconnect the battery terminals.

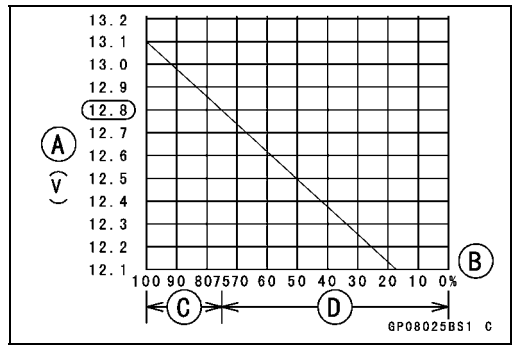
NOTICE

Be sure to disconnect the negative (–) cable first.

● Measure the battery terminal voltage.

NOTE

○*Measure with a digital voltmeter which can be read one decimal place voltage.*

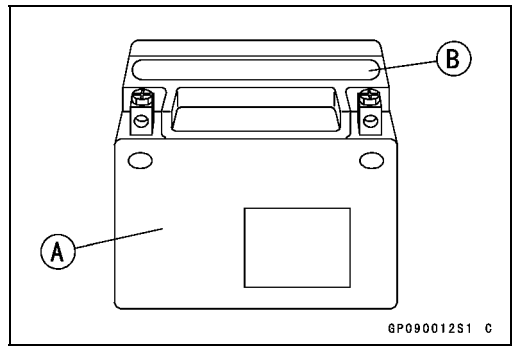


★If the reading is 12.8 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

Battery Terminal Voltage
Standard: 12.8 V or more

Terminal Voltage (V) [A]
Battery Charge Rate (%) [B]
Good [C]
Refresh charge is required [D]

Refreshing Charge



● Remove the battery [A] (see Battery Removal).

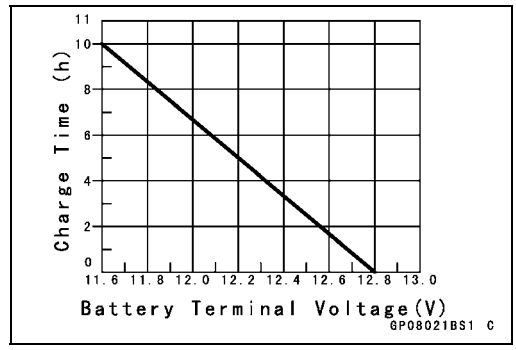
● Do refresh charge by following method according to the battery terminal voltage.

⚠ WARNING

This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.

Battery

Terminal Voltage: 11.5 ~ less than 12.8 V
Standard Charge: 0.9 A × 5 ~ 10 h (see following chart)
Quick Charge: 4 A × 1 h



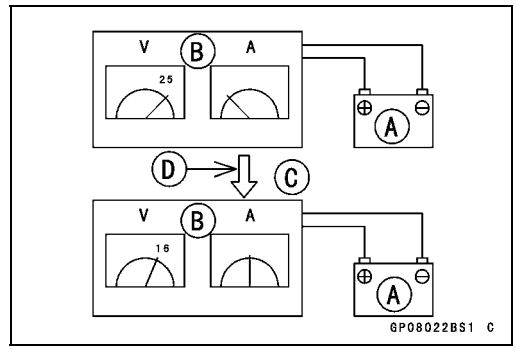
NOTICE

If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.

Terminal Voltage: less than 11.5 V
Charging Method: 0.9 A × 20 h

NOTE

○*Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.*



Battery [A]
Battery Charger [B]
Standard Value [C]
Current starts to flow [D]

● Determine the battery condition after refresh charge.
○Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

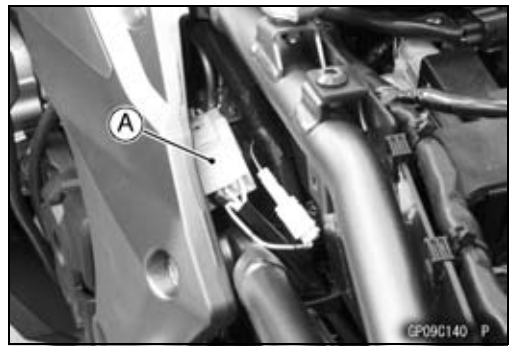
Criteria	Judgement
12.8 V or higher	Good
12.0 ~ lower than 12.8 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace

Charging System

Alternator Cover Removal

- Remove:
  Left Side Cover (see Side Cover Removal in the Frame chapter)
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)

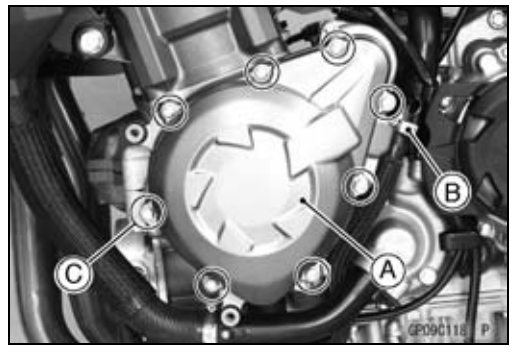
- Disconnect the alternator lead connector [A].



- Place a suitable container under the alternator cover [A].
- Loosen the water hose clamp [B] and move it upward to clear the alternator lead if necessary.

○Do not remove the water hose.

- Remove:
  Alternator Cover Bolts [C]
  Alternator Cover



Alternator Cover Installation

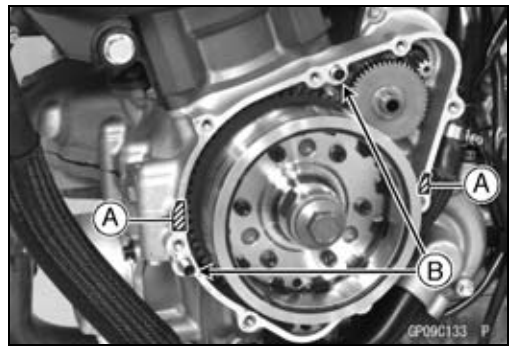
- Using a high flash-point solvent, clean off any oil or dirt that may be on the silicone sealant coating area. Dry them with a clean cloth.
- Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

  Sealant - Liquid Gasket, TB1211F: 92104-0004

- Check that dowel pins [B] are in place on the crankcase.
- Install a new gasket and the alternator cover.
- Tighten:

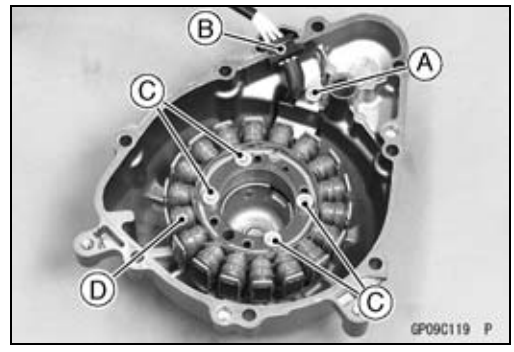
  Torque - Alternator Cover Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Run the alternator lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Confirm that the drain hose and clamp are installed securely and run the hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



Charging System

Stator Coil Removal



- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Holding Plate Bolt [A] and Plate
  Alternator Lead Grommet [B]
  Stator Coil Bolts [C]
- Remove the stator coil [D] from the alternator cover.

Stator Coil Installation

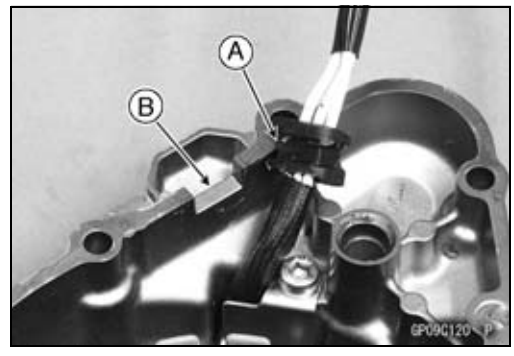
- Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.

  Torque - Stator Coil Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Secure the alternator lead with a holding plate.
- Apply a non-permanent locking agent to the threads of the plate bolt and tighten it.

  Torque - Alternator Lead Holding Plate Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)

- Using a high flash-point solvent, clean off any oil or dirt that may be on the silicone sealant coating area. Dry them with a clean cloth.

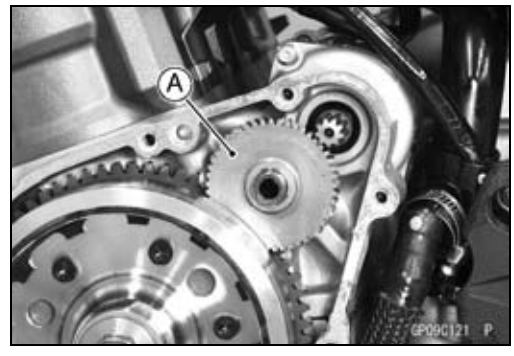


- Apply silicone sealant to the circumference of the alternator lead grommet [A], and fit the grommet into the notch [B] of the cover securely.

  Sealant - Liquid Gasket, TB1211F: 92104-0004

- Install the alternator cover (see Alternator Cover Installation).

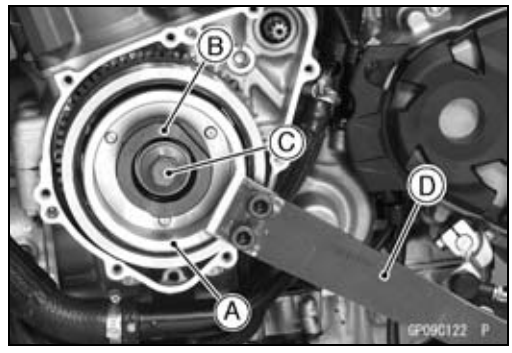
Alternator Rotor Removal



- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Starter Idle Gear [A]

- Hold the alternator rotor steady with the rotor holder [A] and stopper [B].
- Remove the rotor bolt [C] and washer.

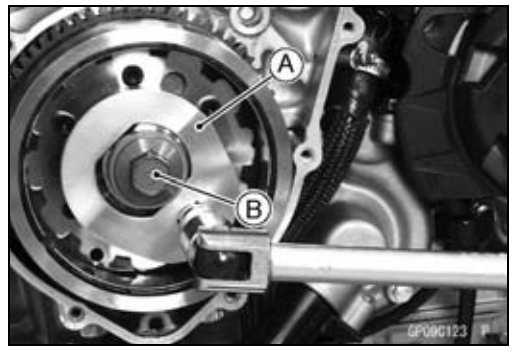
Special Tools - Grip [D]: 57001-1591
Stopper: 57001-1679
Rotor Holder: 57001-1690



If using the rotor holder (57001-1757).

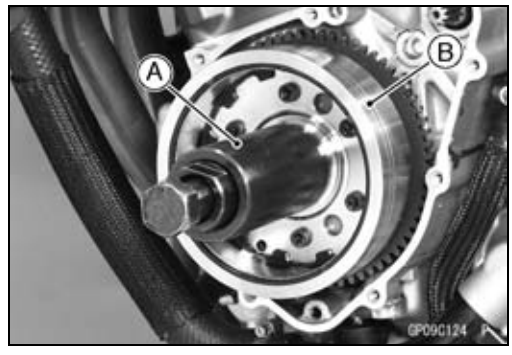
- Hold the alternator rotor steady with the rotor holder [A].
- Remove the rotor bolt [B] and washer.

Special Tool - Rotor Holder: 57001-1757



- Using the flywheel puller [A], remove the alternator rotor [B] from the crankshaft.

Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1615

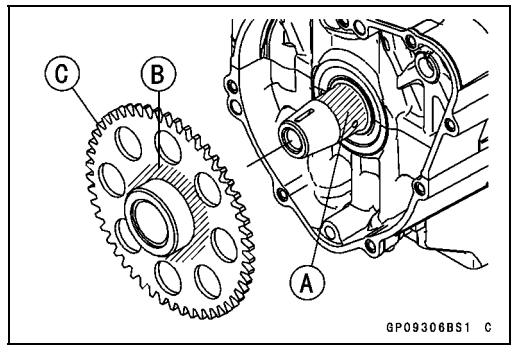


NOTICE

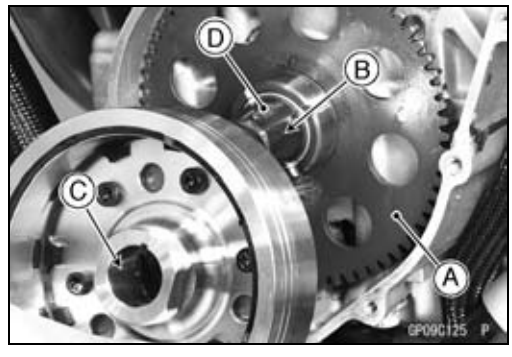
Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.

Alternator Rotor Installation

- Apply a thin coat of molybdenum disulfide grease to the crankshaft [A] and the outer surface [B] of the starter clutch gear [C].

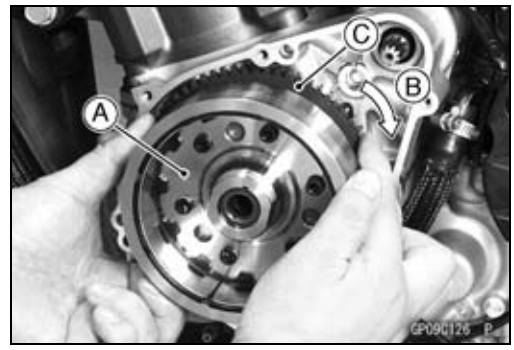


- Install the starter clutch gear [A].
- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  Crankshaft Tapered Portion [B]
  Alternator Rotor Tapered Portion [C]
- Fit the woodruff key [D] securely in the slot in the crankshaft before installing the alternator rotor.



Charging System

- Install the alternator rotor [A] while turning [B] the starter clutch gear [C] clockwise.



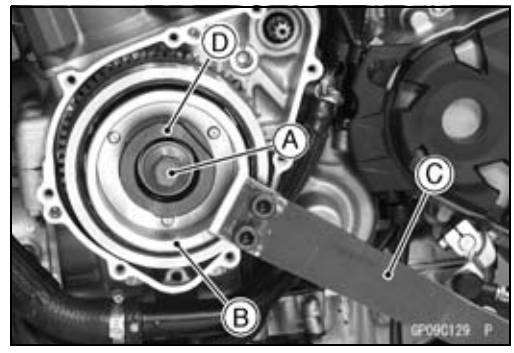
NOTE

○*Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.*

- Install the washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B] temporarily.

Special Tools - Grip [C]: 57001-1591
Rotor Holder: 57001-1690
Stopper [D]: 57001-1679

Torque - Alternator Rotor Bolt: 70 N·m (7.0 kgf·m, 52 ft·lb)

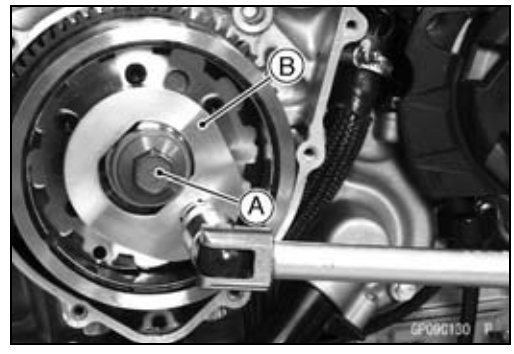


If using rotor holder (57001-1757).

- Install the washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B] temporarily.

Special Tool - Rotor Holder: 57001-1757

Torque - Alternator Rotor Bolt: 70 N·m (7.0 kgf·m, 52 ft·lb)

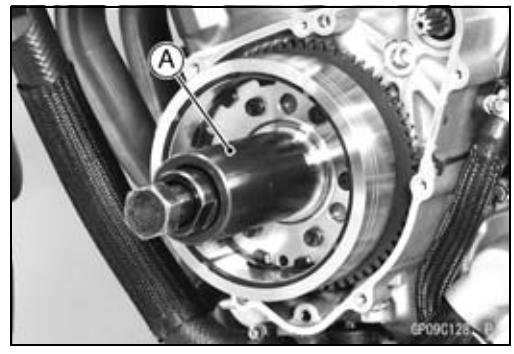


- Remove the rotor bolt and washer (see Alternator Rotor Removal).
- Check the tightening torque with flywheel puller [A].

Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1615

★If the rotor is pulled out with under 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.

★If the rotor is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly. Tighten the alternator rotor bolt with specified torque as follows.

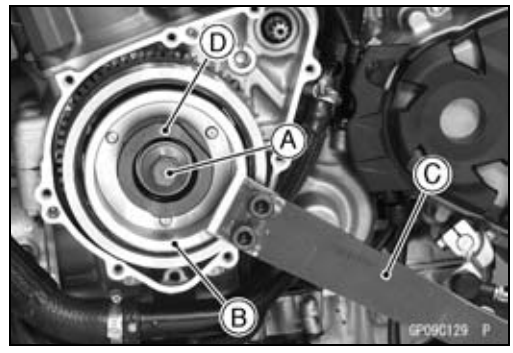


Charging System

- Install the washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B].

Special Tools - Grip [C]: 57001-1591
Rotor Holder: 57001-1690
Stopper [D]: 57001-1679

Torque - Alternator Rotor Bolt: 155 N·m (15.8 kgf·m, 114 ft·lb)

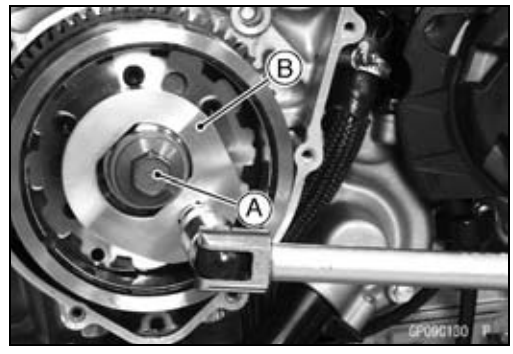


If using rotor holder (57001-1757).

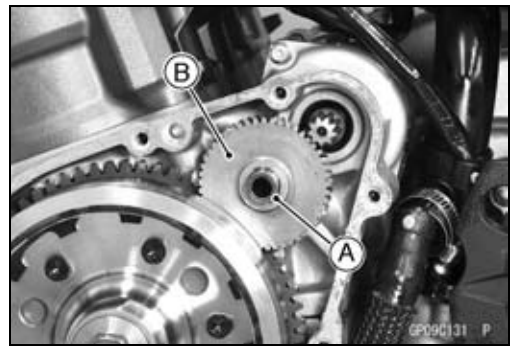
- Install the washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B].

Special Tool - Rotor Holder: 57001-1757

Torque - Alternator Rotor Bolt: 155 N·m (15.8 kgf·m, 114 ft·lb)

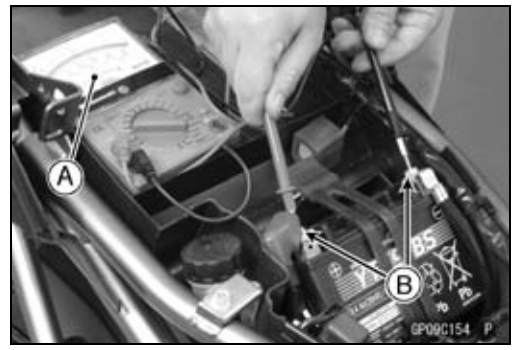


- Apply a thin coat of molybdenum disulfide grease to the shaft [A], and install it and starter idle gear [B].
- Install the alternator cover (see Alternator Cover Installation).



Charging System

Charging Voltage Inspection



- Check the battery condition (see Charging Condition Inspection).
- Warm up the engine to obtain actual alternator operating conditions.
- Check that the ignition switch is turned off, and connect the hand tester [A] to the battery terminals [B].

Special Tool - Hand Tester: 57001-1394

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight, disconnect the headlight connector on the headlight unit.). The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.

Charging Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
25 V DC	Battery (+)	Battery (–)	14.4 ~ 15.0 V

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.

★If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.

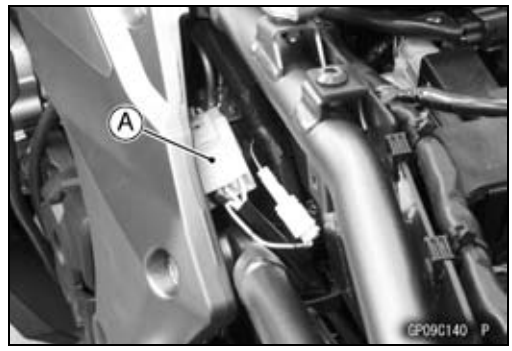
★If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.

★If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

Alternator Inspection

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.

Charging System



● To check the alternator output voltage, do the following procedures.
○Turn the ignition switch to OFF.
○Remove the left side cover (see Side Cover Removal in the Frame chapter).
○Disconnect the alternator lead connector [A] (see alternator Cover Removal).
○Connect the hand tester as shown in the table 1.
○Start the engine.
○Run it at the rpm given in the table 1.
○Note the voltage readings (total 3 measurements).

Table 1 Alternator Output Voltage

Tester Range	Connections		Reading at 4 000 rpm
	Tester (+) to	Tester (–) to	
250 V AC	One White lead	Another White lead	44.8 V or more

★If the output voltage shows the value in the table, the alternator operates properly.
★If the output voltage shows a much higher than the value in the table, the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.
● Check the stator coil resistance as follows.
○Stop the engine.
○Connect the hand tester as shown in the table 2.
○Note the readings (total 3 measurement).

Table 2 Stator Coil Resistance **at 20°C (68°F)**

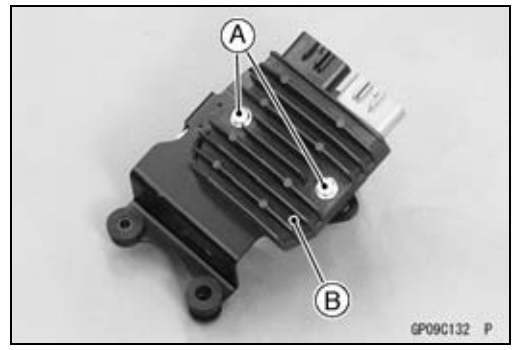
Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
× 1 Ω	One White lead	Another White lead	0.17 ~ 0.25 Ω

★If there is more resistance than shown in the table, or no hand tester reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
● Using the highest resistance range of the hand tester, measure the resistance between each of the black leads and chassis ground.
★Any hand tester reading less than infinity (∞) indicates a short, necessitating stator replacement.
★If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Special Tool - Hand Tester: 57001-1394

Charging System

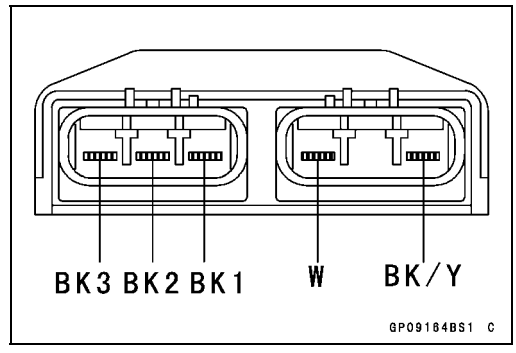
Regulator/Rectifier Inspection



- Remove:
  ABS Hydraulic Unit (see ABS Hydraulic Unit Removal in the Brakes chapter)
  Bolts [A]
  Regulator/Rectifier [B]

- Set the hand tester to the × 1 kΩ range and make the measurements shown in the table.

  Special Tool - Hand Tester: 57001-1394



- Connect the hand tester to the regulator rectifier.

★If the tester readings are not as specified, replace the regulator/rectifier.

NOTICE

Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.
If a megger or a meter with a large capacity battery is used, the regulator/rectifier will be damaged.

Regulator/Rectifier Resistance **(Unit: kΩ)**

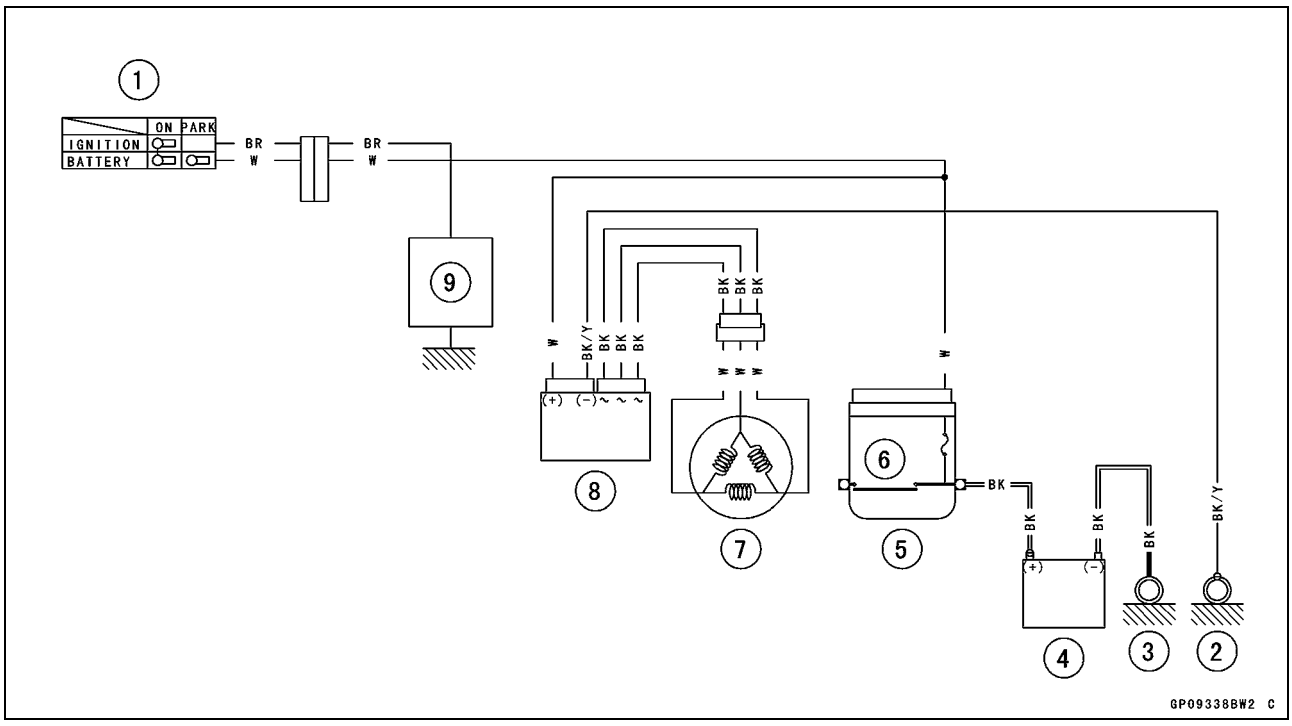
		Tester (+) Lead Connection				
	Terminal	W	BK1	BK2	BK3	BK/Y
(–)*	W	–	20 ~ 300	20 ~ 300	20 ~ 200	20 ~ 750
	BK1	0 ~ 5	–	20 ~ 300	20 ~ 200	20 ~ 750
	BK2	0 ~ 5	20 ~ 300	–	20 ~ 200	20 ~ 750
	BK3	0 ~ 5	20 ~ 300	20 ~ 300	–	20 ~ 750
	BK/Y	5 ~ 20	5 ~ 20	5 ~ 20	5 ~ 20	–

(−)*: Tester (−) Lead Connection

- Install the regulator/rectifier.

Charging System

Charging System Circuit



1. Ignition Switch
2. Frame Ground 2
3. Engine Ground
4. Battery 12 V 8 Ah
5. Starter Relay
6. Main Fuse 30 A
7. Alternator
8. Regulator/Rectifier
9. Load

Ignition System

⚠ WARNING

The ignition system produces extremely high voltage. Do not touch the spark plug, ignition coil or ignition coil lead while the engine is running, or you could receive a severe electrical shock.

NOTICE

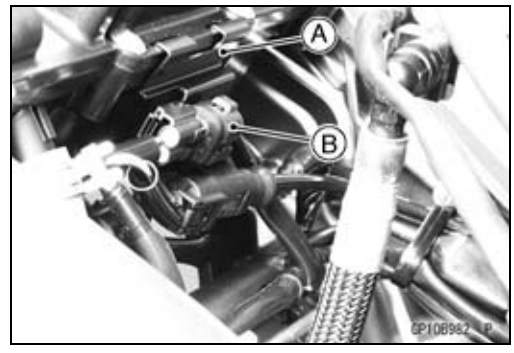
Do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running. This is to prevent ECU damage.
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.

Crankshaft Sensor Removal

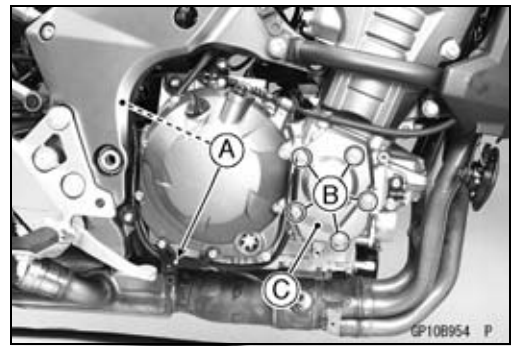
NOTICE

Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.

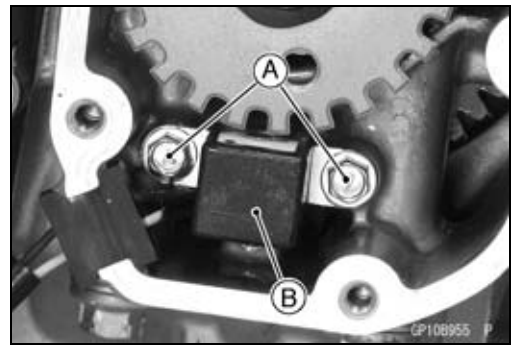
- Remove the right lower fairing (see Lower Fairing Removal in the Frame chapter).
- Support the fuel tank with a suitable bar (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Pull up the connector bracket [A].
- Disconnect the crankshaft sensor lead connector [B].



- Clear the crankshaft sensor lead from the clamps [A].
- Remove:
  Crankshaft Sensor Cover Bolts [B]
  Crankshaft Sensor Cover [C]



- Remove:
  Crankshaft Sensor Bolts [A]
  Crankshaft Sensor [B]



Crankshaft Sensor Installation

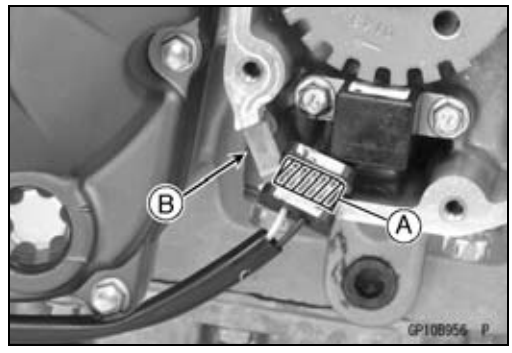
- Tighten:

  Torque - Crankshaft Sensor Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)

- Using a high flash-point solvent, clean off any oil or dirt that may be on the silicone sealant coating area. Dry them with a clean cloth.

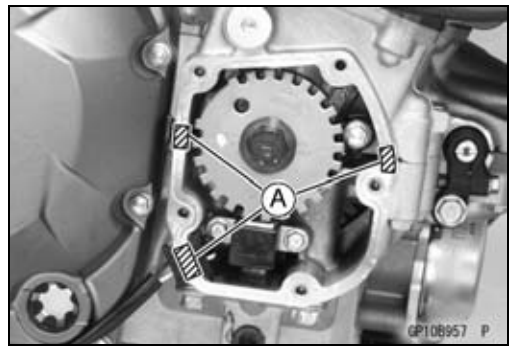
● Apply silicone sealant to the circumference of the alternator lead grommet [A], and fit the grommet into the notch [B] of the lower crankcase securely.

Sealant - Liquid Gasket, TB1211F: 92104-0004



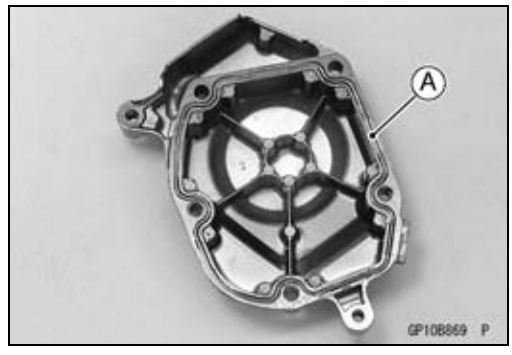
● Apply silicone sealant [A] to the crankshaft sensor lead grommet and crankcase halves mating surface on the front and rear sides of the crankshaft sensor cover mount.

Sealant - Liquid Gasket, TB1211F: 92104-0004



● Replace the O-ring [A] in the crankshaft sensor cover with a new one.

○Apply grease to the O-ring.



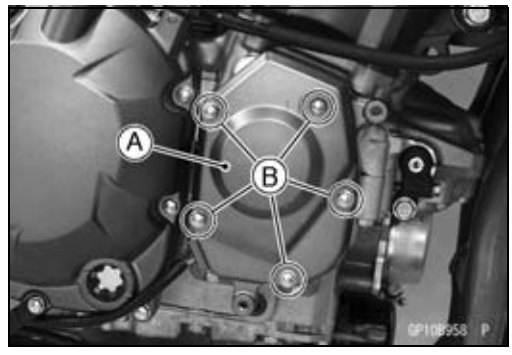
● Install:
Crankshaft Sensor Cover [A]

● Tighten:

Torque - Crankshaft Sensor Cover Bolts [B]: 12 N·m (1.2 kgf·m, 106 in·lb)

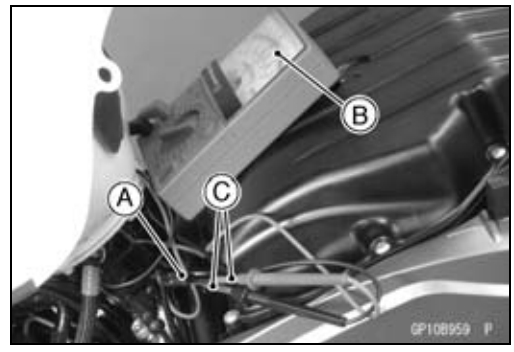
● Run the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

● Install the removed parts (see appropriate chapters).



Ignition System

Crankshaft Sensor Inspection



- Support the fuel tank with a suitable bar (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the crankshaft sensor [A] (see Crankshaft Sensor Removal).
- Set the hand tester [B] to the × 10 Ω range and connect (+) lead to the yellow lead and (–) lead to the black lead in the connector.

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set [C]: 57001-1457

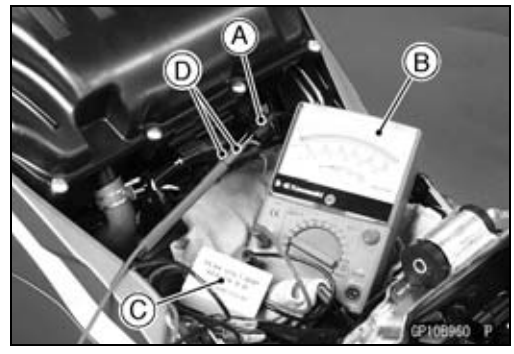
Crankshaft Sensor Resistance: 376 ~ 564 Ω

★If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.

★Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the crankshaft sensor assembly.

Crankshaft Sensor Peak Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Crankshaft Sensor Lead Connector [A] (see Crankshaft Sensor Removal)
- Set the hand tester [B] to the DC 10 V range.
- Connect the peak voltage adapter [C] to the hand tester and crankshaft sensor leads in the connector.

Special Tools - Hand Tester: 57001-1394
Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B
Needle Adapter Set [D]: 57001-1457

Connections:

Crankshaft Sensor Lead		Peak Voltage Adapter		Hand Tester
Yellow	←	Red	→	(+)
Black	←	Black	→	(–)

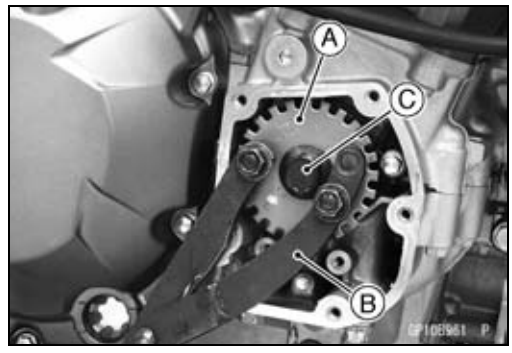
- Turn the ignition switch and engine stop switch to ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

Crankshaft Sensor Peak Voltage
Standard: 2.0 V or more

★If the tester reading is not specified one, inspect the crankshaft sensor (see Crankshaft Sensor Inspection).

Ignition System

Timing Rotor Removal

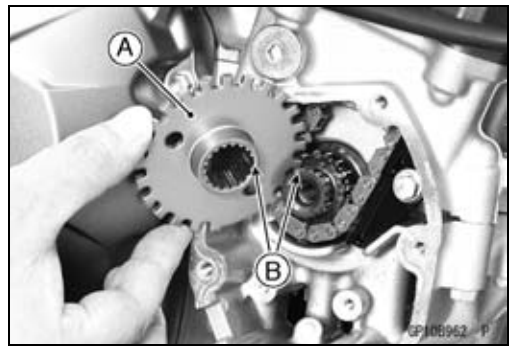


- Remove the crankshaft sensor (see Crankshaft Sensor Removal).
- Remove the timing rotor [A].

○Holding the timing rotor with the flywheel & pulley holder [B] and remove the rotor bolt [C].

Special Tool - Flywheel & Pulley Holder: 57001-1605

Timing Rotor Installation

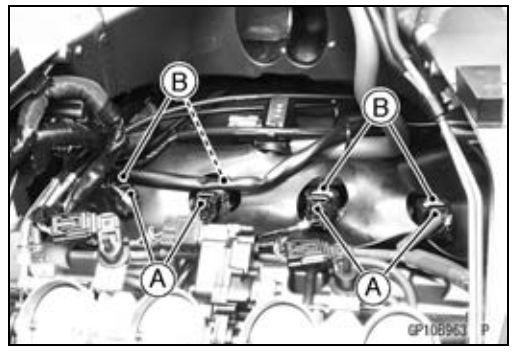


- Install the timing rotor [A] with the their theeth [B] aligned.
- Tighten:

Torque - Timing Rotor Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)

Special Tool - Flywheel & Pulley Holder: 57001-1605

Stick Coil Removal



NOTICE

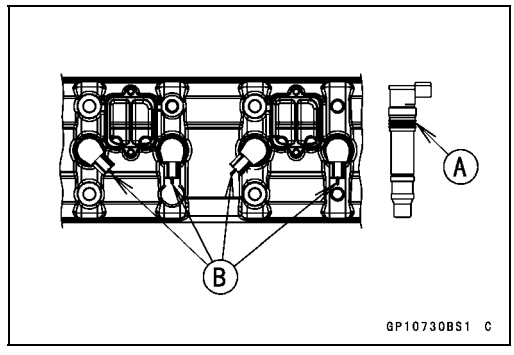
Never drop the stick coils, especially on a hard surface.
Such a shock to the stick coils can damage it.

- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
- Disconnect the stick coil connectors [A].
- Pull the stick coils [B].

NOTICE

Do not pry the connector part of the coil while removing the coil.

Stick Coil Installation



- Pull up the rubber cover forward.
- Apply a thin coat of grease [A] to the stick coils for easy installation.
- Insert the stick coils so that the coil heads align with the lines [B] on the cylinder head cover.

NOTICE

Do not tap the coil head while installing the coil.

- After installation, be sure the stick coils are installed securely by pulling up them lightly.
- Reposition the rubber cover and connect the stick coil connectors.
- Run the hoses and harness correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

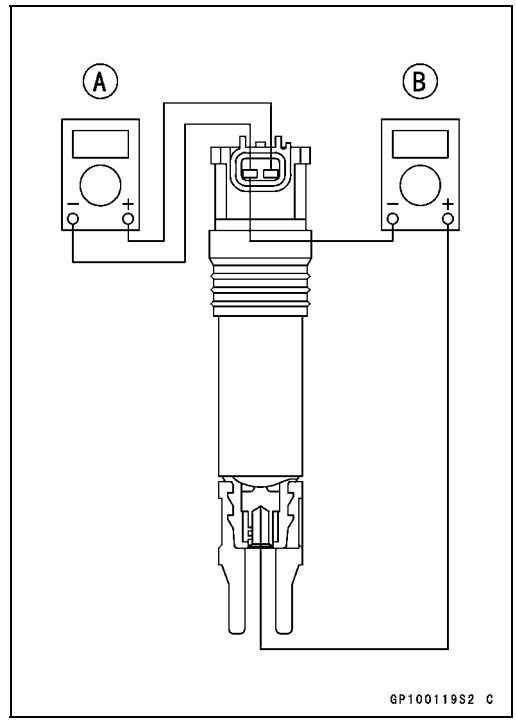
NOTE

○*Be careful not to tight the stick coil leads.*

- Install the removed parts (see appropriate chapters).

Ignition System

Stick Coil Inspection



- Remove the stick coils (see Stick Coil Removal).
- Measure the primary winding resistance [A] as follows.

○Connect the hand tester between the coil terminals.
○Set the tester to the × 1 Ω range, and read the tester.

- Measure the secondary winding resistance [B] as follows.

○Connect the tester between the plug terminal and (–) coil terminal.
○Set the tester to the × 1 kΩ range and read the tester.

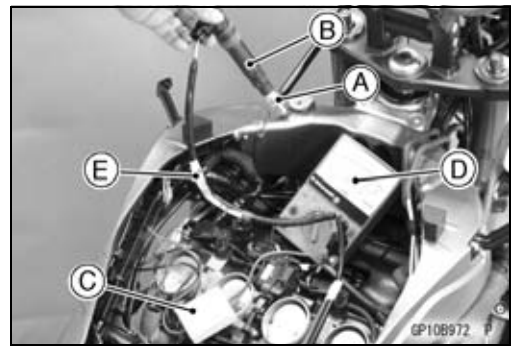
Stick Coil Winding Resistance
Primary Windings: 1.1 ~ 1.5 Ω
Secondary Windings: 10.8 ~ 16.2 kΩ

★If the tester does not read as specified, replace the coil.

Stick Coil Primary Peak Voltage

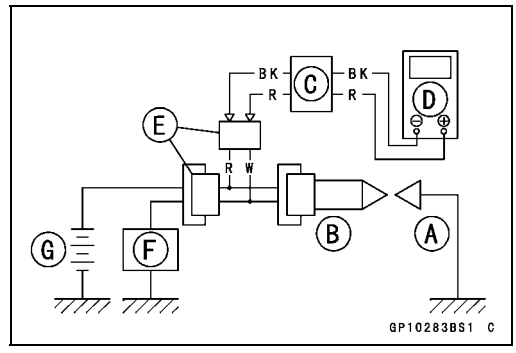
NOTE

○*Be sure the battery is fully charged.*



- Remove the stick coils (see Stick Coil Removal), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.

○Install the new spark plug [A] into each stick coil [B], and ground them onto the engine.
○Connect the peak voltage adapter [C] into the hand tester [D] which is set to the DC 250 V range.
○Connect the adapter to the lead wire-peak voltage adapter [E] which is connected between the stick coil connector and stick coil.
ECU [F]
Battery [G]



Special Tools - Hand Tester: 57001-1394
Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B
Lead Wire-Peak Voltage Adapter: 57001-1449

Primary Lead Connection
Adapter (R, +) to lead wire-peak voltage adapter (W)
Adapter (BK, –) to lead wire-peak voltage adapter (R)

Ignition System

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the ignition switch and the engine stop switch to ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one stick coil.

Stick Coil Primary Peak Voltage
Standard: 100 V or more

- Repeat the test for the other stick coil.

★If the reading is less than the specified value, check the following.
Stick Coils (see Stick Coil Inspection)
Crankshaft Sensor (see Crankshaft Sensor Inspection)
ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)

Spark Plug Removal

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

Spark Plug Installation

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

Spark Plug Condition Inspection

- Remove the spark plugs (see Spark Plug Replacement).
- Visually inspect the spark plugs.

★If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug.

★If the spark plug is dirtied or the carbon is accumulated, replace the spark plug.

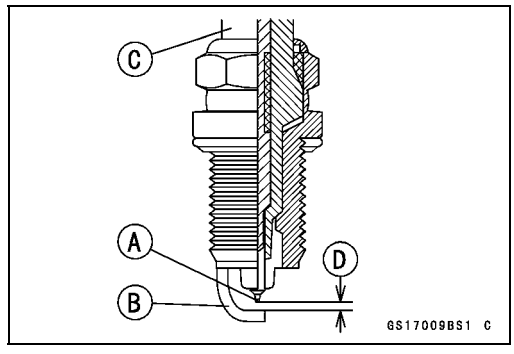
- Measure the gap [D] with a wire-type thickness gauge.

★If the gap is incorrect, replace the spark plug.

Spark Plug Gap: 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)

- Use the standard spark plug or its equivalent.

Spark Plug: NGK CR9EIA-9



Interlock Operation Inspection

- Raise the rear wheel off the ground with stand.
- Turn the engine stop switch to ON (run position).

1st Check

- Start the engine to the following conditions.

Condition:
Transmission Gear → 1st Position
Clutch Lever → Release
Sidestand → Down or Up

○Turn the ignition switch to ON and push the starter button.
○Then the starter motor should not turn when the starter system circuit is normality.

★If the engine is start, inspect the starter lockout switch, sidestand switch, neutral switch and relay box.

Ignition System

2nd Check

● Start the engine to the following conditions.

Condition:

Transmission Gear → 1st Position

Clutch Lever → Pulled in

Sidestand → Up

○Turn the ignition switch to ON and push the starter button.

○Then the starter motor should turn when the starter system circuit is normality.

★If the starter motor is not turn, inspect the starter lockout switch, sidestand switch, relay box, and starter relay.

3rd Check

● Inspect the engine for its secure stop after the following operations are completed.

● Run the engine to the following conditions.

Condition:

Transmission Gear → 1st Position

Clutch Lever → Pulled in

Sidestand → Up

● Set the sidestand on the ground, then the engine will stop.

★If the engine does not stop, inspect the neutral switch, sidestand switch and relay box.

★If their parts are normality, replace the ECU.

IC Igniter Inspection

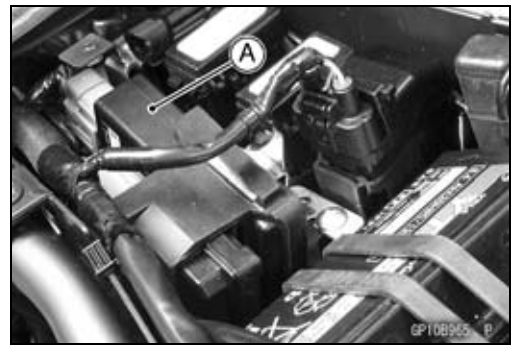
○The IC igniter is built in the ECU [A].

● Refer to the following items.

Interlock Operation Inspection (see Interlock Operation Inspection)

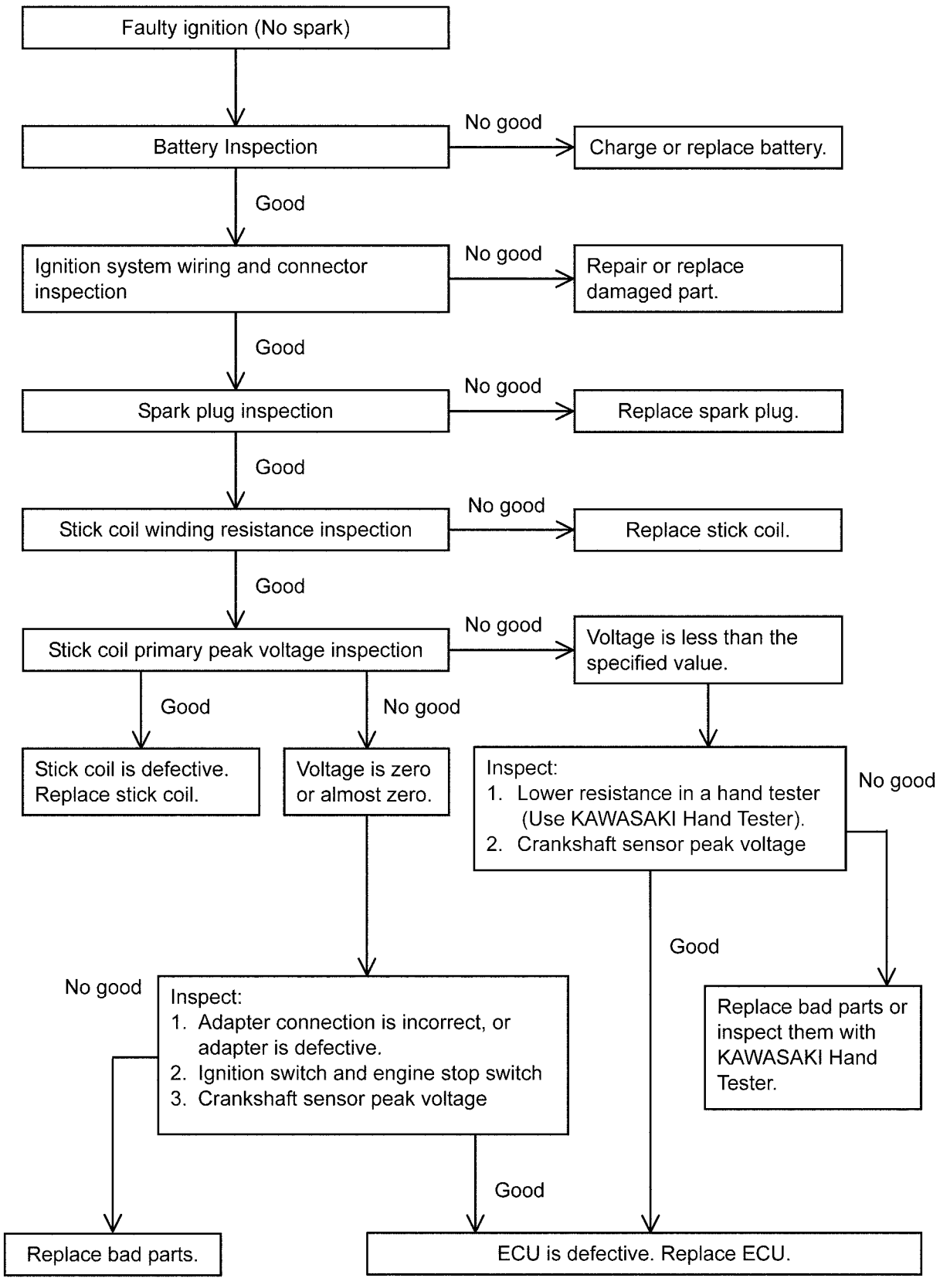
Ignition System Troubleshooting (see Ignition System section)

ECU Power Supply Inspection (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)



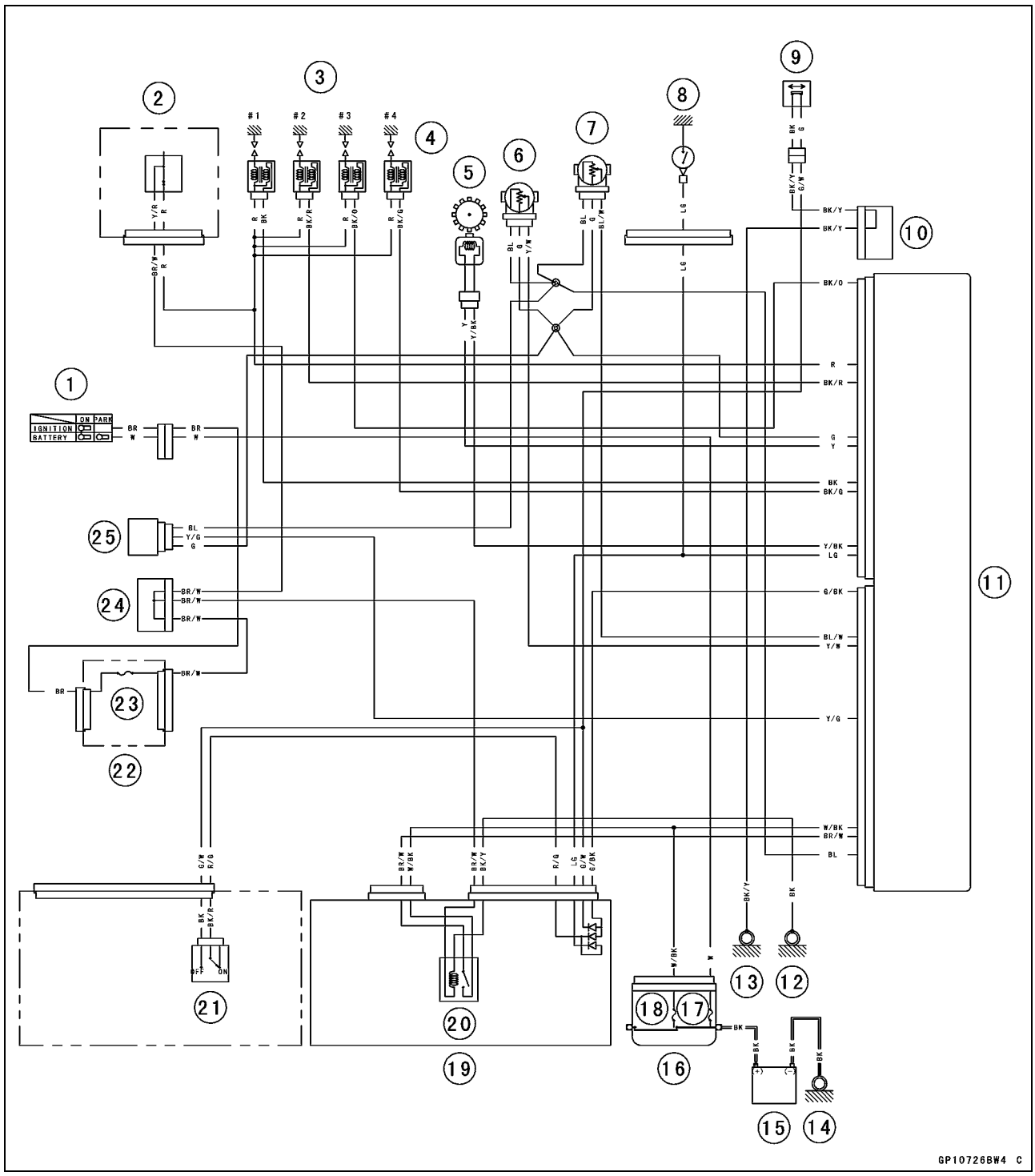
Ignition System

Ignition System Troubleshooting



Ignition System

Ignition System Circuit



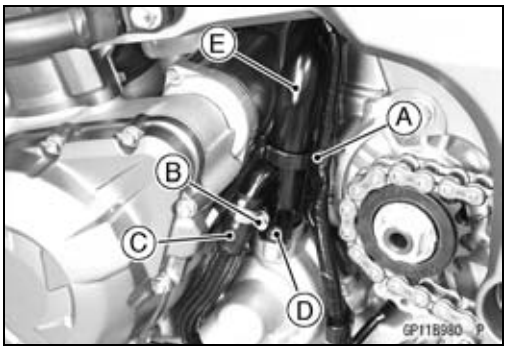
1. Ignition Switch
2. Engine Stop Switch
3. Spark Plugs
4. Stick Coils
5. Crankshaft Sensor
6. Main Throttle Sensor
7. Subthrottle Sensor
8. Neutral Switch
9. Sidestand Switch
10. Joint Connector E
11. ECU
12. Frame Ground 3
13. Frame Ground 1
14. Engine Ground
15. Battery 12 V 8 Ah
16. Starter Relay
17. Main Fuse 30 A
18. ECU Fuse 15 A
19. Relay Box
20. ECU Main Relay
21. Starter Lockout Switch
22. Fuse Box 1
23. Ignition Fuse 15 A
24. Joint Connector F
25. Vehicle-down Sensor

Electric Starter System

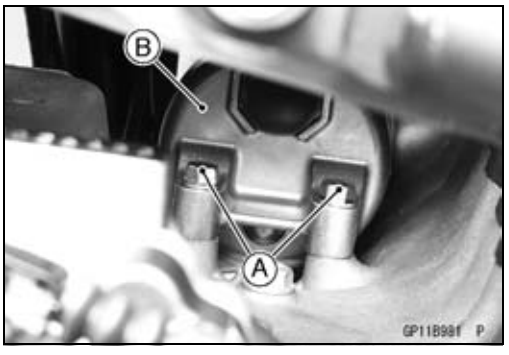
Starter Motor Removal

NOTICE

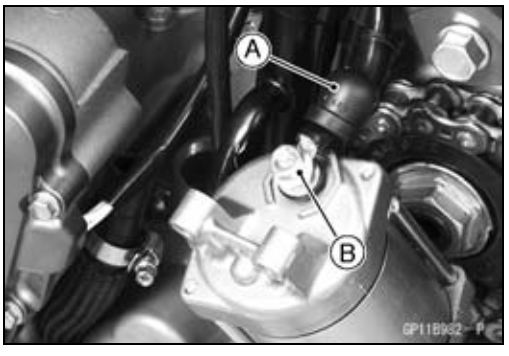
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.



- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Engine Sprocket Cover (see Engine Sprocket Cover Removal in the Final Drive chapter)
  Harness Holder [A]
- Loosen the water hose clamp screw [B].
- Remove:
  Water Hose [C]
  Water Pipe Bolt [D]
  Water Pipe [E]



- Remove the mounting bolts [A].
- Pull out the starter motor [B] with the cable connected.

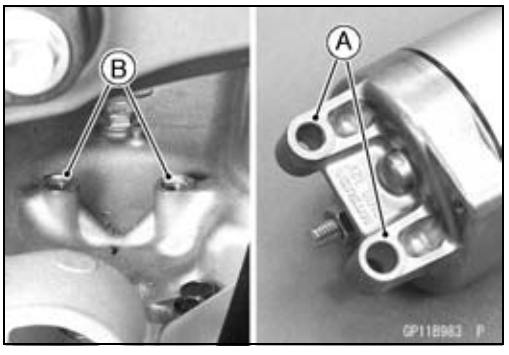


- Slide the rubber cap [A].
- Remove the starter motor cable terminal nut [B] and cable.

Starter Motor Installation

NOTICE

Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.



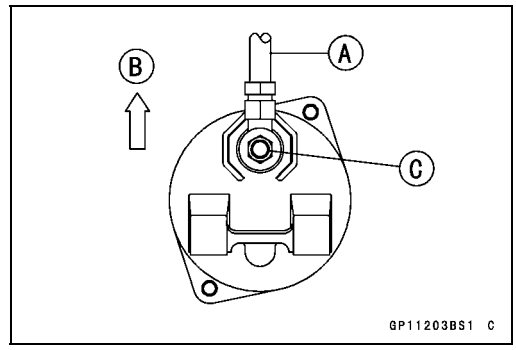
- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.

Electric Starter System

- Install the starter motor cable [A] as shown.
  [B] Upward
- Tighten:

Torque - Starter Motor Cable Terminal Nut [C]: 5.9 N·m (0.60 kgf·m, 52 in·lb)

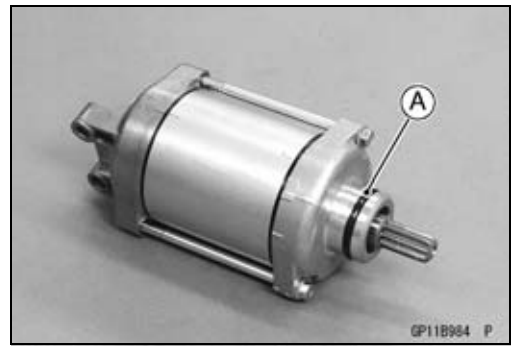
- Slide back the rubber cap to the original position.



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Tighten:

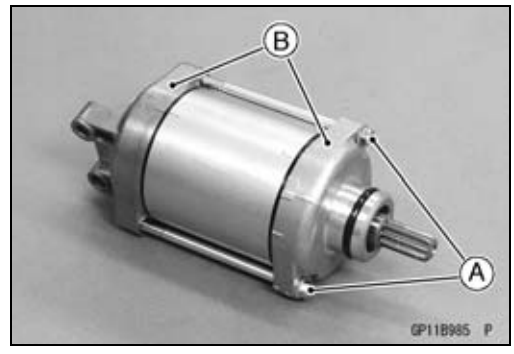
Torque - Starter Motor Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the water hose and pipe (see Water Pump Installation in the Cooling System chapter).
- Install the removed parts.



Starter Motor Disassembly

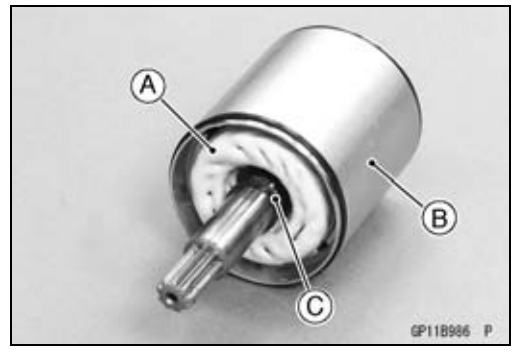
- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor through bolts [A] and remove the both end covers [B].



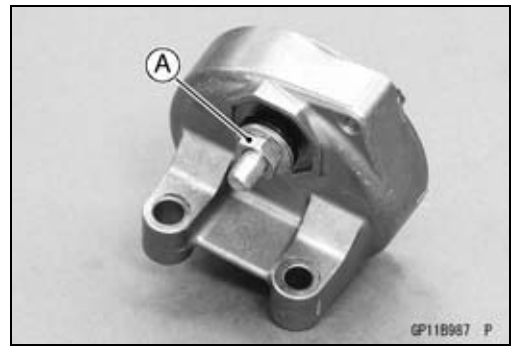
- Pull out the armature [A] out of the yoke [B].

NOTE

○*Do not remove the circlip [C] from the shaft.*

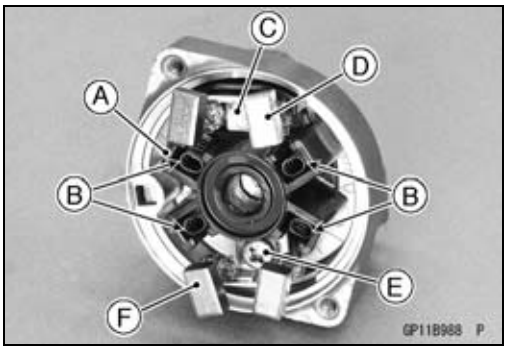


- Remove the starter motor terminal locknut [A].



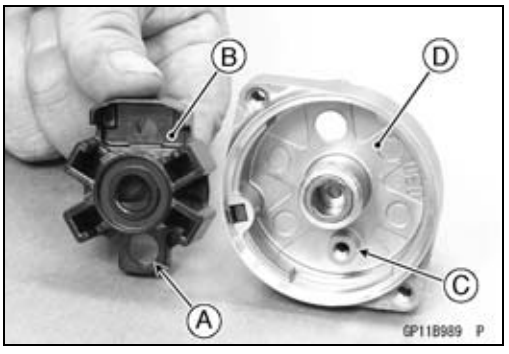
Electric Starter System

- Pull out the brushes from the brush holder [A].
- Remove:
  Brush Springs [B]
  Starter Motor Terminal [C]
  Positive Brush Assy [D]
  Screw [E]
  Negative Brush Assy [F]
  Brush Holder



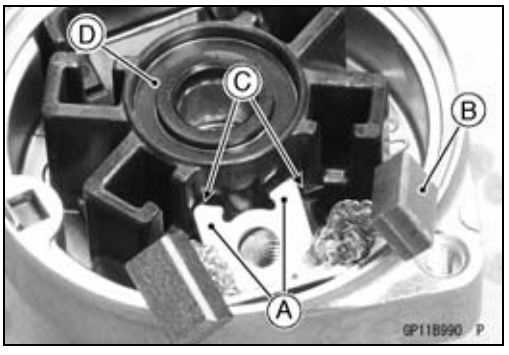
Starter Motor Assembly

- Align the hole [A] of the brush holder [B] to the boss [C] of the right-hand end cover [D].

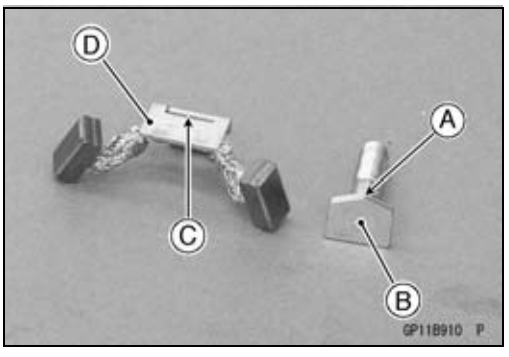


- Align the stoppers [A] of the negative brush assy [B] to the guides [C] of the brush holder [D].
- Tighten:

Torque - Bush Holder Screw: 3.8 N·m (0.39 kgf·m, 34 in·lb)

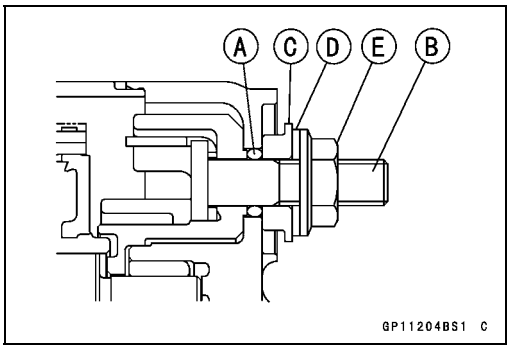


- Insert the jagged porition [A] on the starter motor terminal [B] to the slit [C] on the positive brush assy [D].
- Install the starter motor terminal to the brush holder.



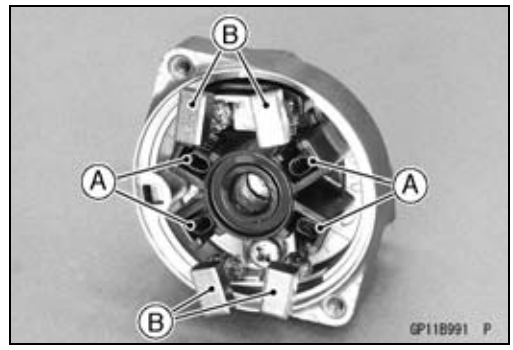
- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Install the following parts to the starter motor terminal [B].
  New O-ring
  Collar [C]
  Washer [D]
  Starter Motor Terminal Locknut [E]
- Install the collar so that stepped side faces outward.
- Tighten:

Torque - Starter Motor Terminal Locknut: 11 N·m (1.1 kgf·m, 97 in·lb)

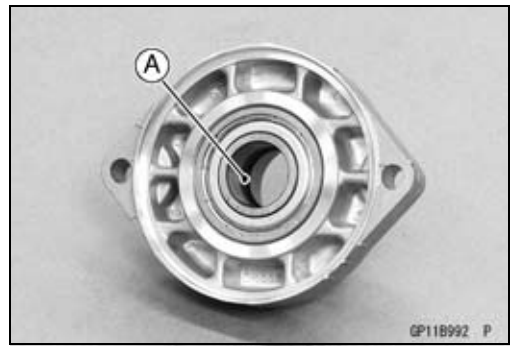


Electric Starter System

- Install the brush springs [A] and insert the brushes [B].



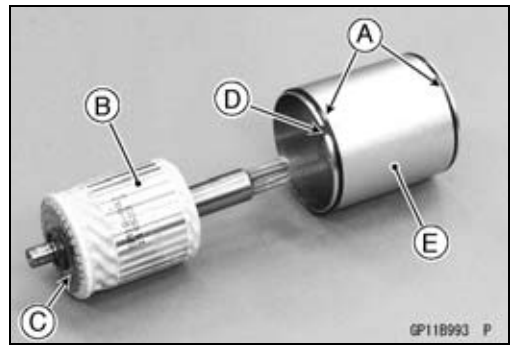
- Apply thin coat of grease to the oil seal [A].



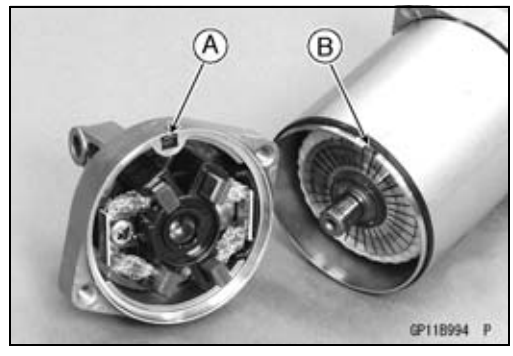
- Replace the O-rings [A] with new ones.

○Apply grease to the O-rings.

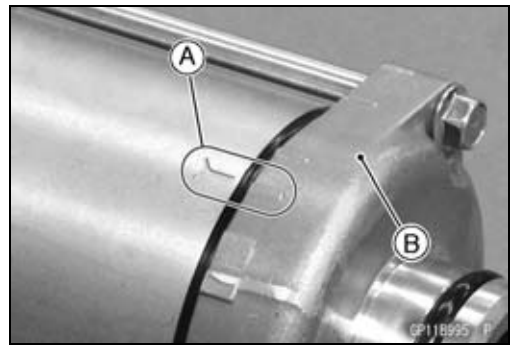
- Insert the armature [B] so that commutator side [C] faces hollow side [D] of the yoke [E].



- Align the stopper [A] and hollow [B] to assemble the yoke and end cover.



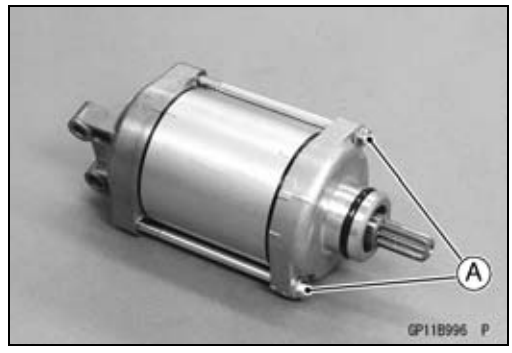
- Align the marks [A] to assemble the yoke and the end cover [B].



Electric Starter System

● Tighten:

Torque - Starter Motor Through Bolts [A]: 5.0 N·m (0.51 kgf·m, 44 in·lb)



Brush Inspection

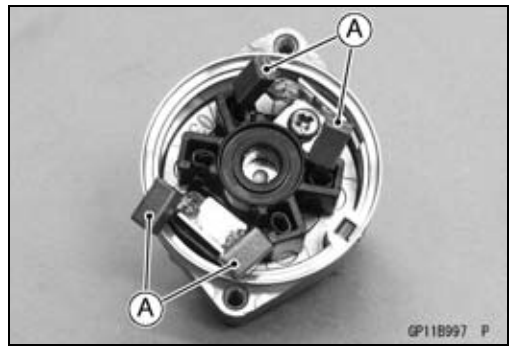
● Measure the length of each brushes [A].

★If any is worn down to the service limit, replace the brush assy.

Starter Motor Brush Length

Standard: 12 mm (0.47 in.)

Service Limit: 6.5 mm (0.26 in.)



Commutator Cleaning and Inspection

● Clean the metallic debris off the between commutator segments [A].

NOTE

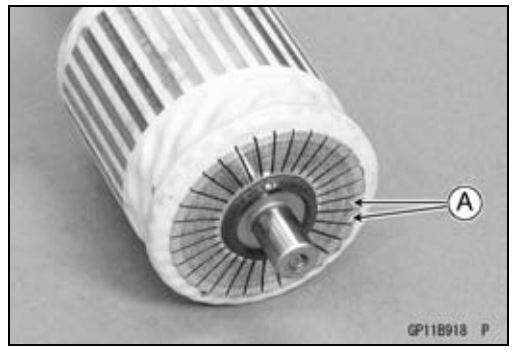
○*Do not use emery or sand paper on the commutator.*

● Check the commutator for damage or abnormal wear.

★Replace the starter motor with a new one if there is any damage or wear.

● Visually inspect the commutator segments for discoloration.

★Replace the starter motor with a new one if discoloration is noticed.



Armature Inspection

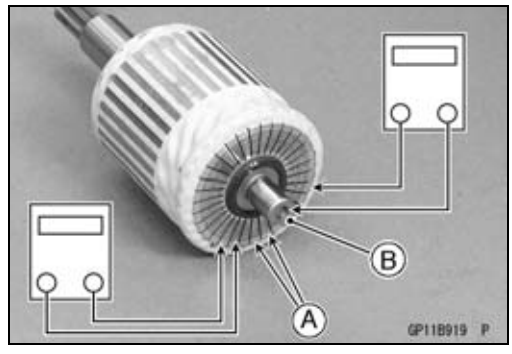
● Using the × 1 Ω hand tester range, measure the resistance between any two commutator segments [A].

Special Tool - Hand Tester: 57001-1394

★If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.

● Using the highest hand tester range, measure the resistance between the segments and the shaft [B].

★If there is any reading at all, the armature has a short and the starter motor must be replaced.

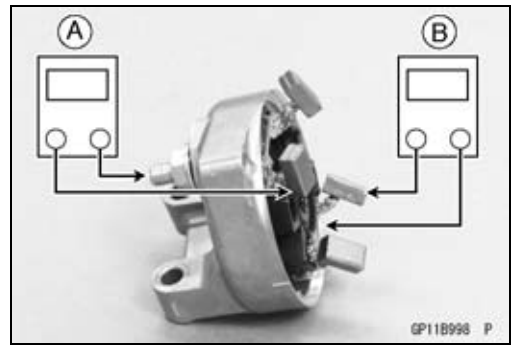


NOTE

○*Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.*

Electric Starter System

Brush Lead Inspection

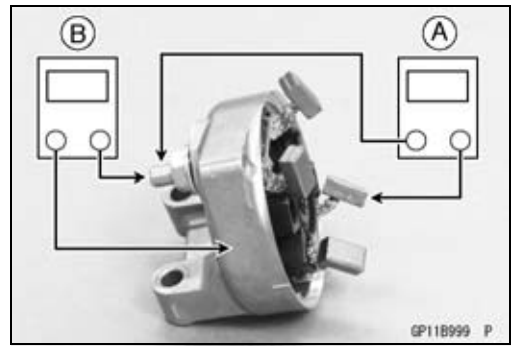


- Using the × 1 Ω hand tester range, measure the resistance as shown.
  Right-hand End Cover and Negative Brushes [A]
  Terminal Bolt and Positive Brushes [B]

Special Tool - Hand Tester: 57001-1394

★If there is not close to zero ohms, the brush lead has an open. Replace the brush plate assy.

Right-hand End Cover Inspection



- Using the highest hand tester range, measure the resistance as shown.
  Terminal Bolt and Right-hand End Cover [A]
  Terminal Bolt and Negative Brushes [B]

Special Tool - Hand Tester: 57001-1394

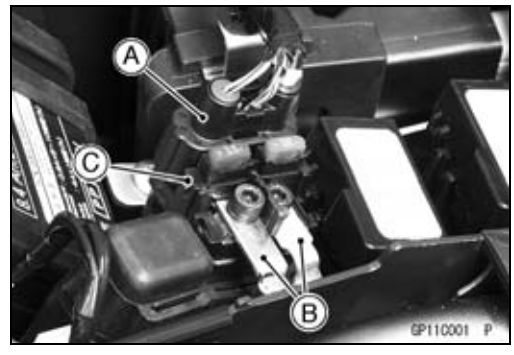
★If there is any reading, the brush assy and/or terminal bolt assy have a short. Replace the starter motor.

Starter Relay Inspection

- Remove:
  Battery Negative (–) Cable (see Battery Removal)

- Remove the cable terminal cover [A].

- Disconnect:
  Connector [A]
  Cable Terminals [B]
- Remove:
  Starter Relay [C]



Electric Starter System

● Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown in the figure.

Special Tool - Hand Tester: 57001-1394

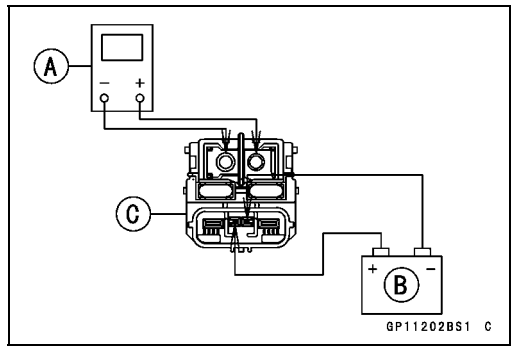
★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

Tester Range: × 1 Ω range

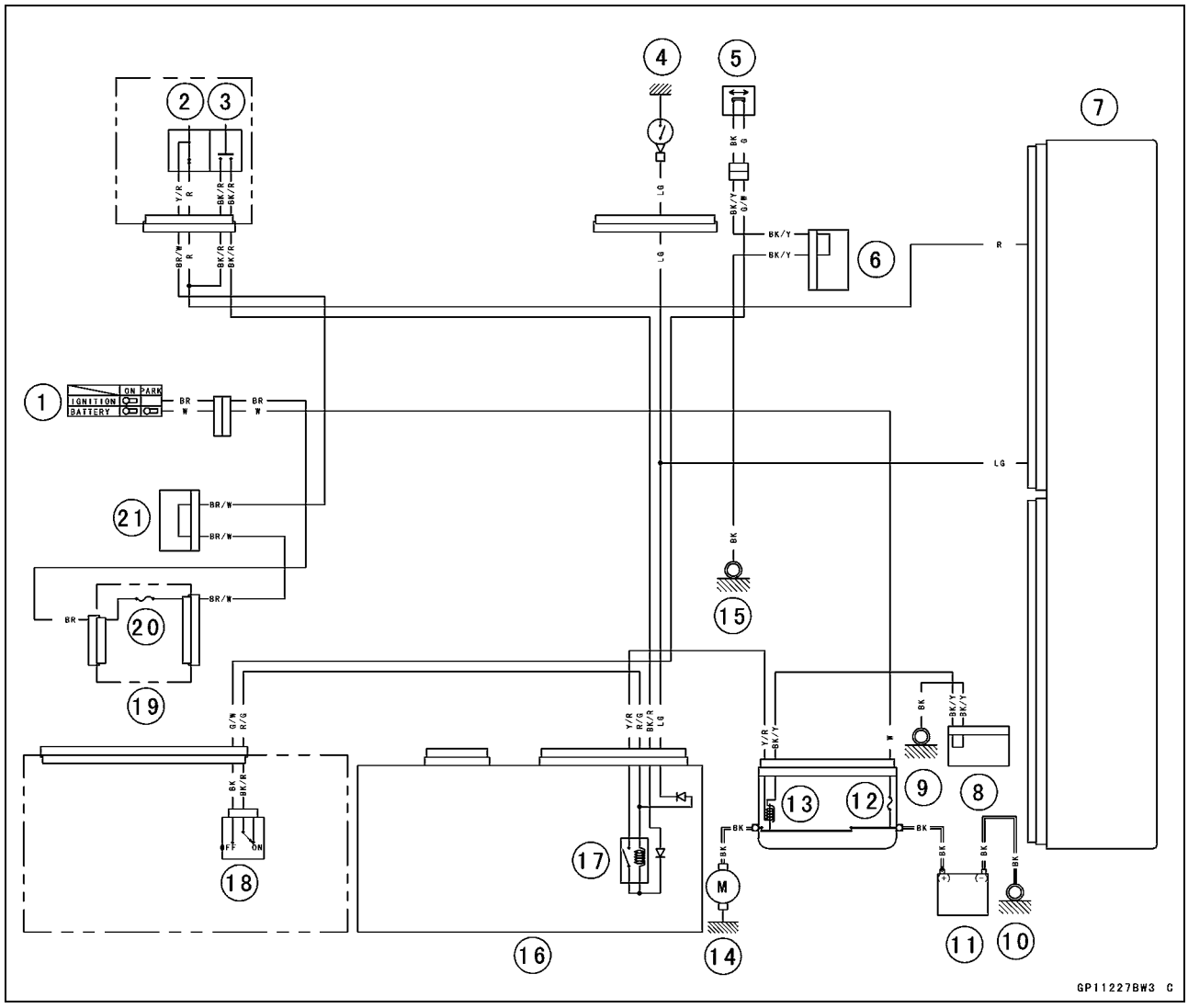
Criteria: When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω



Electric Starter System

Electric Starter Circuit



1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Neutral Switch
5. Sidestand Switch
6. Joint Connector E
7. ECU
8. Joint Connector B
9. Frame Ground 3
10. Engine Ground
11. Battery 12 V 8 Ah
12. Main Fuse 30 A
13. Starter Relay
14. Starter Motor
15. Frame Ground 1
16. Relay Box
17. Starter Circuit Relay
18. Starter Lockout Switch
19. Fuse Box 1
20. Ignition Fuse 15 A
21. Joint Connector F

Lighting System

This motorcycle adopt the daylight system and have a headlight relay in the relay box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

Headlight Beam Horizontal Adjustment

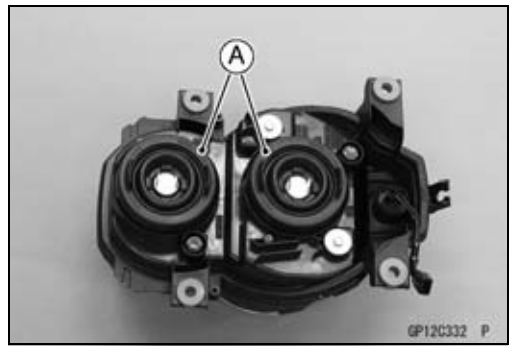
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Beam Vertical Adjustment

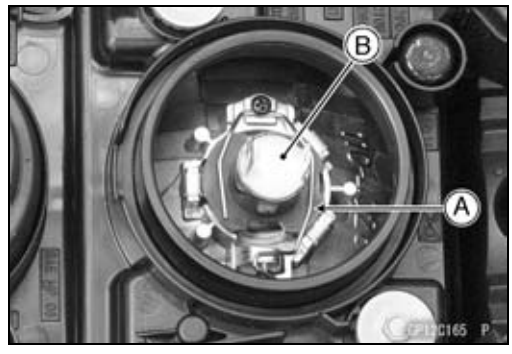
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Bulb Replacement

- Remove:
  Headlight Assy (see Headlight Removal/Installation)
  Headlight Bulb Dust Covers [A]



- Remove:
  Hook [A]
  Headlight Bulb [B]



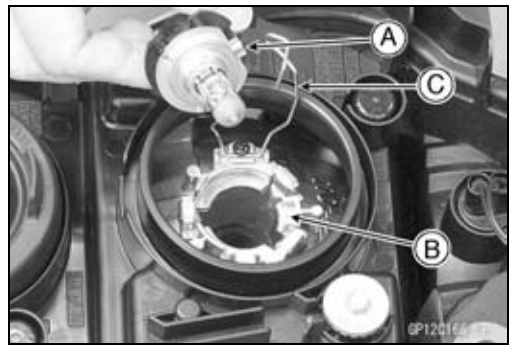
NOTICE

When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.

NOTE

○*Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.*

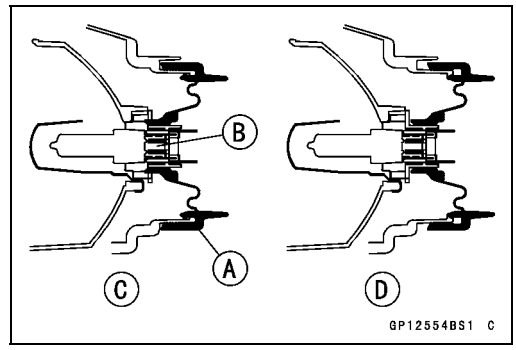
- Replace the headlight bulb.
- Fit the projection [A] of the bulb in the hollow [B] of the headlight.
- Install the hook [C].



Lighting System

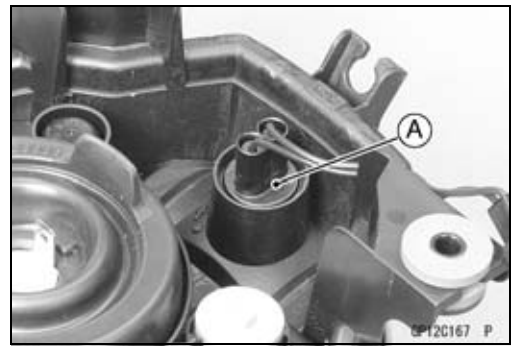
- Fit the dust cover [A] onto the bulb [B] firmly as shown.
  Good [C]
  Bad [D]
- After installation, adjust the headlight aim (see Headlight Aiming Inspection in the Periodic Maintenance chapter).

○Other Bulb: Repeat the above steps.



City Light Bulb Replacement

- Remove the headlight assy (see Headlight Removal/Installation).
- Turn the socket [A] counterclockwise and remove it.

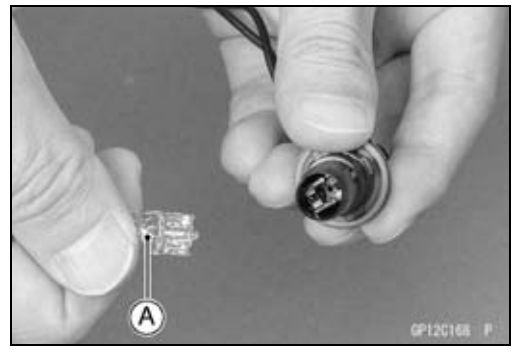


- Pull the bulb [A] out of the socket.

NOTICE

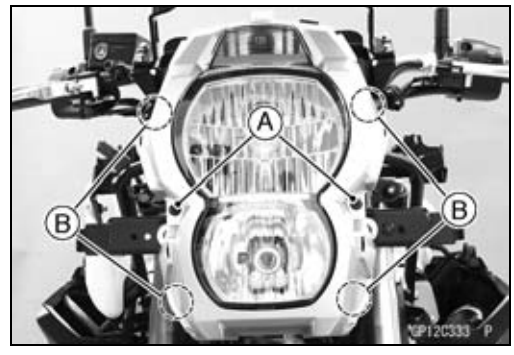
Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage then the specified valve.

- Replace the bulb with a new one.



Headlight Cover Removal

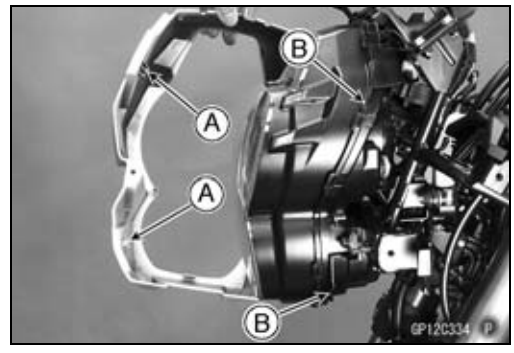
- Remove:
  Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  Upper Side Fairings (see Upper Side Fairing Removal in the Frame chapter)
  Meter Cover (see Meter Cover Removal in the Frame chapter)
  Screws [A]
- Clear the hook portions [B].



Headlight Cover Installation

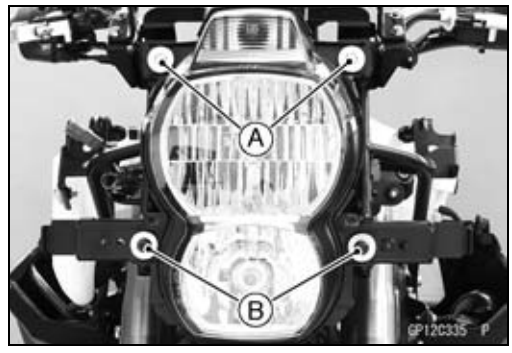
○Insert the hook portions [A] of the left and right into the ribs [B].

- Tighten the screws.

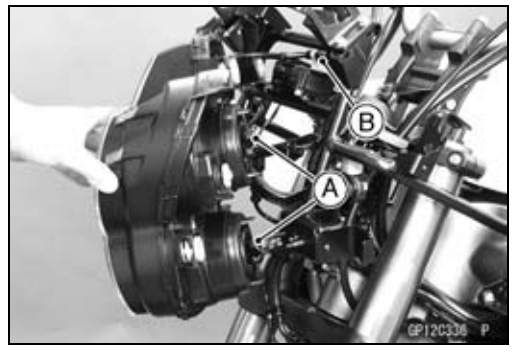


Lighting System

Headlight Removal/Installation

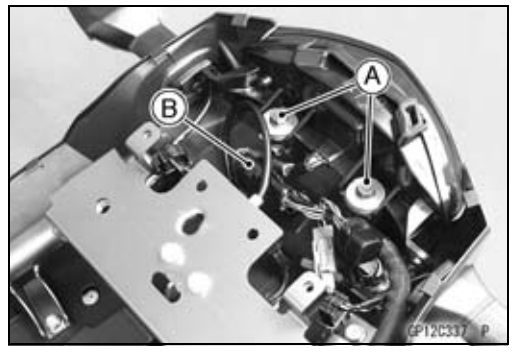


- Remove:
  Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  Upper Side Fairings (see Upper Side Fairing Removal in the Frame chapter)
  Meter Cover (see Meter Cover Removal in the Frame chapter)
  Headlight Cover (see Headlight Cover Removal)
  Mounting Bolts [A]
  Mounting Nuts [B]



- Disconnect the headlight connectors [A] and city light connector [B].
- Remove the headlight assy.
- Installation is the reverse of removal.

Tail/Brake Light (LED) Removal

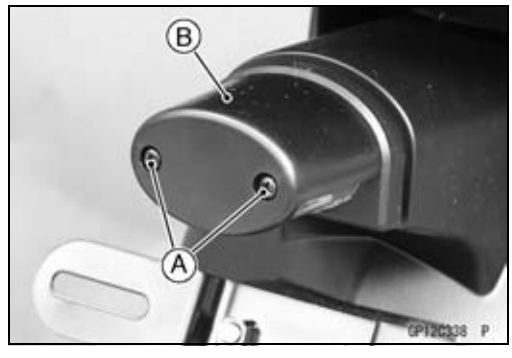


- Remove:
  Seat Cover (see Seat Cover Removal in the Frame chapter)
  Tail/Brake Light Mounting Bolts [A]
- Disconnect the tail/brake light lead connector [B] to remove the tail/brake light (LED).

Tail/Brake Light (LED) Installation

- Installation is the reverse of removal.
- Tighten the tail/brake light mounting bolts securely.

License Plate Light Bulb Replacement



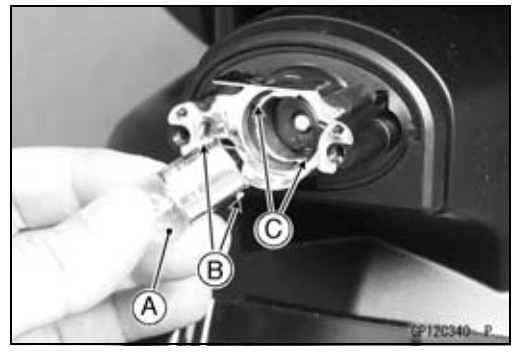
- Remove:
  Screws [A]
  License Plate Light Cover [B] and Lens

Lighting System

- Push and turn the bulb [A] counterclockwise and remove it.
- Replace the bulb with a new one.

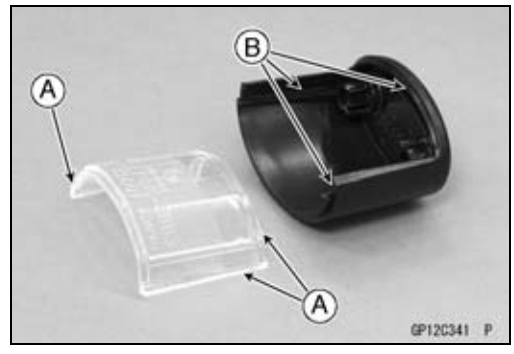
- Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.

○Turn the bulb about 15°.



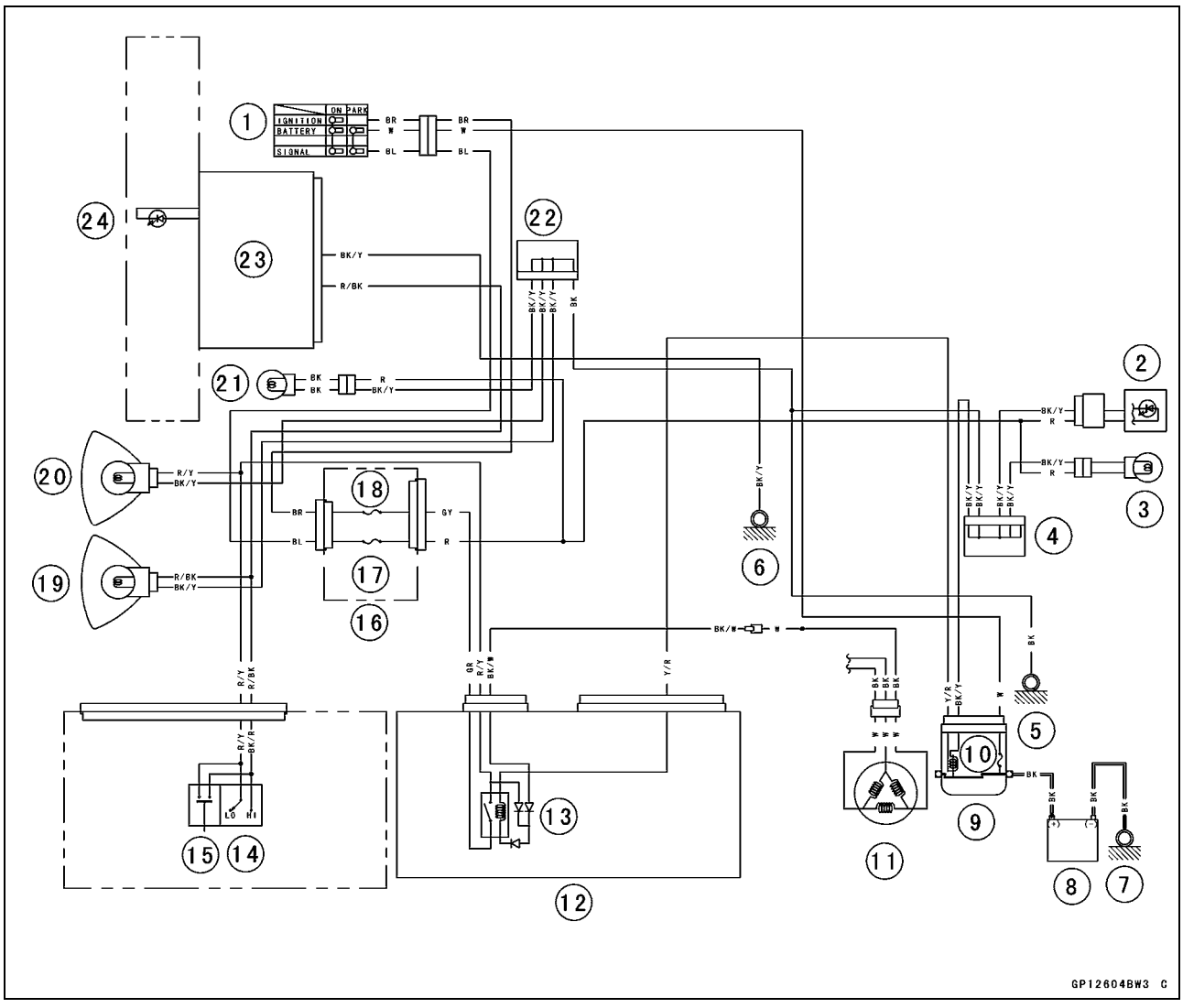
- Fit the projections [A] on the lens to the cover grooves [B].
- Tighten the license plate light cover screws.

Torque - Licence Plate Light Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)



Lighting System

Headlight/Tail Light Circuit

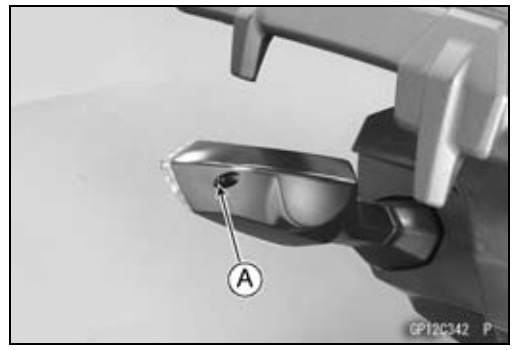


1. Ignition Switch
2. Tail/Brake Light (LED)
3. License Plate Light 12 V 5 W
4. Joint Connector B
5. Frame Ground 3
6. Frame Ground 1
7. Engine Ground
8. Battery 12 V 8 Ah
9. Starter Relay
10. Main Fuse 30 A
11. Alternator
12. Relay Box
13. Headlight Circuit Relay
14. Dimmer Switch
15. Passing Button
16. Fuse Box 1
17. Turn Signal Relay Fuse 7.5 A
18. Headlight Relay Fuse 15 A
19. Headlight (High) 12 V 55 W
20. Headlight (Low) 12 V 55 W
21. City Light 12 V 5 W
22. Joint Connector A
23. Meter Unit
24. Blue High Beam Indicator Light (LED)

Lighting System

Turn Signal Light Bulb Replacement

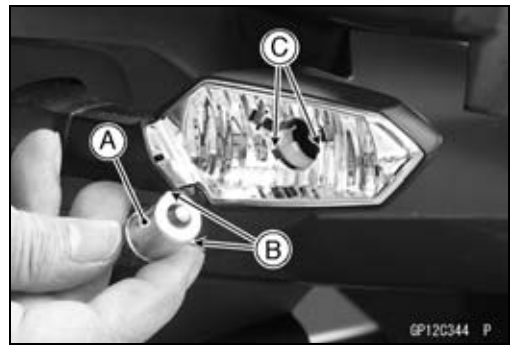
● Unscrew the screw [A] and remove the lens.



● Push and turn the bulb [A] counterclockwise and remove it.

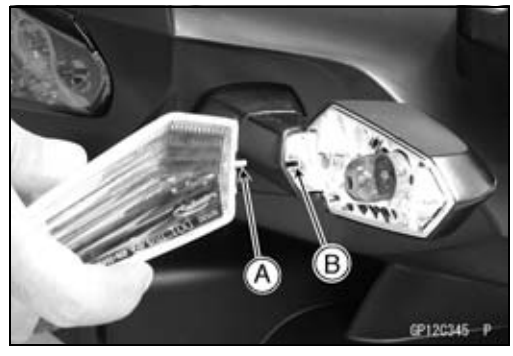
● Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.

○Turn the bulb about 15°.



● Fit the projection [A] on the lens to the groove [B] on the socket.

● Tighten the screw.



Turn Signal Relay Inspection

● Remove:

Right Upper Side Fairing (see Upper Side Fairing Removal in the Frame chapter)

● Pull up the turn signal relay [A].

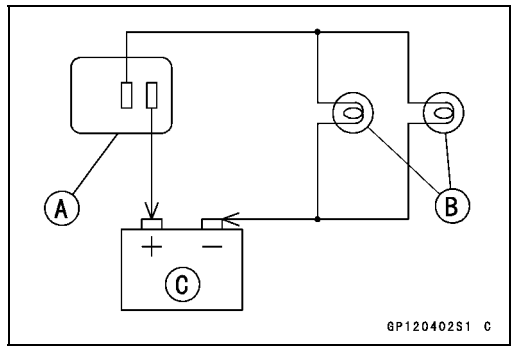
● Disconnect the turn signal relay connector.

○In this photo, the meter cover has been removed for clearly.

Lighting System

- Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights blink for one minute.
  Turn Signal Relay [A]
  Turn Signal Lights [B]
  12 V Battery [C]

★If the lights do not blink as specified, replace the turn signal relay.



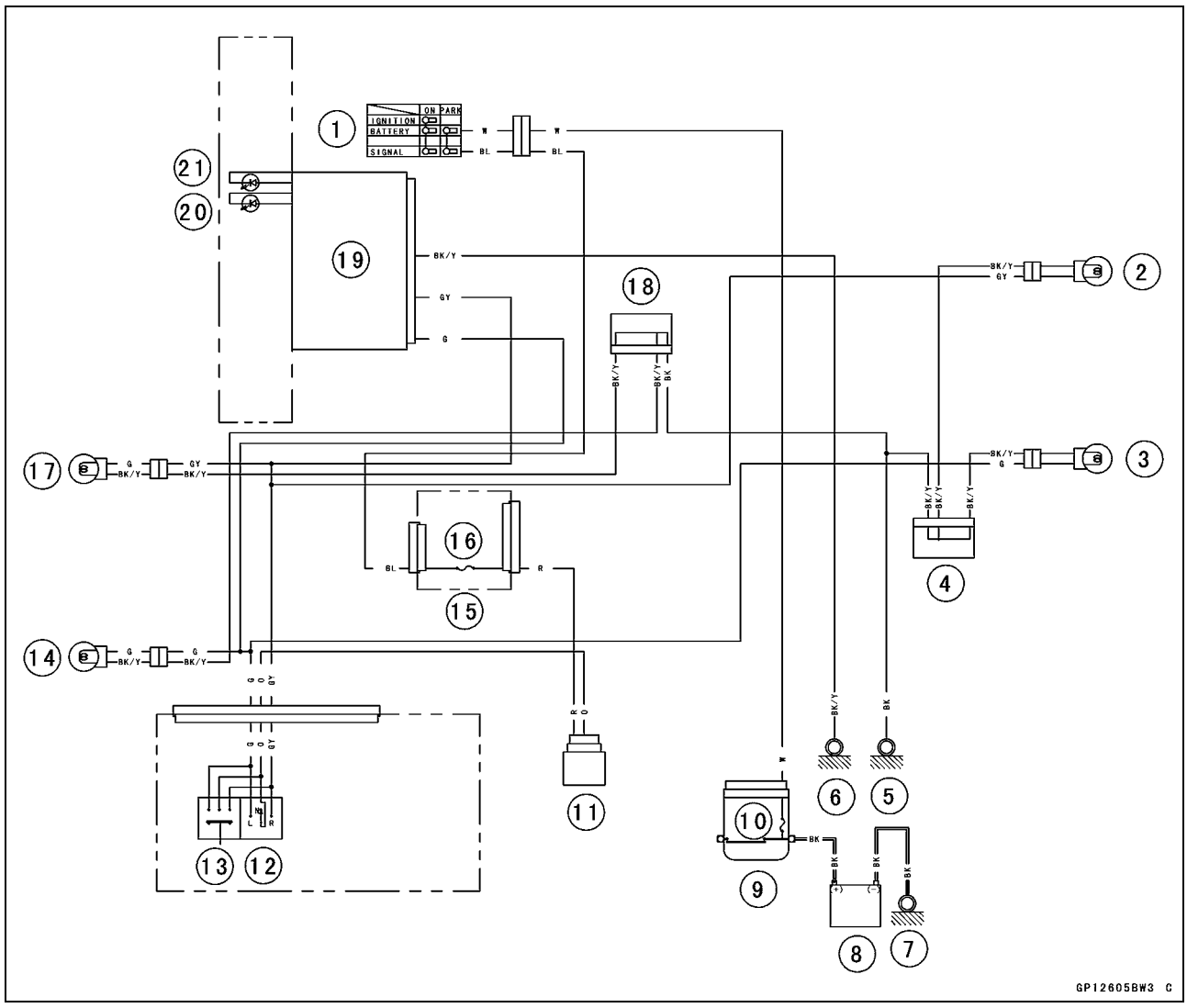
Testing Turn Signal Relay

Load		Blinking Times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	10	140-250
2	20	75-95

*: Cycle(s) per minute
**: Correspond to “one light burned out”

Lighting System

Turn Signal Light Circuit



1. Ignition Switch
2. Rear Right Turn Signal Light 12 V 10 W
3. Rear Left Turn Signal Light 12 V 10 W
4. Joint Connector B
5. Frame Ground 3
6. Frame Ground 1
7. Engine Ground
8. Battery 12 V 8 Ah
9. Starter Relay
10. Main Fuse 30 A
11. Turn Signal Relay
12. Turn Signal Switch
13. Hazzard Button
14. Front Left Turn Signal Light 12 V 10 W
15. Fuse Box 1
16. Turn Signal Relay Fuse 7.5 A
17. Front Right Turn Signal Light 12 V 10 W
18. Joint Connector A
19. Meter Unit
20. Green Right Turn Signal Indicator Light (LED)
21. Green Left Turn Signal Indicator Light (LED)

Air Switching Valve

Air Switching Valve Operation Test

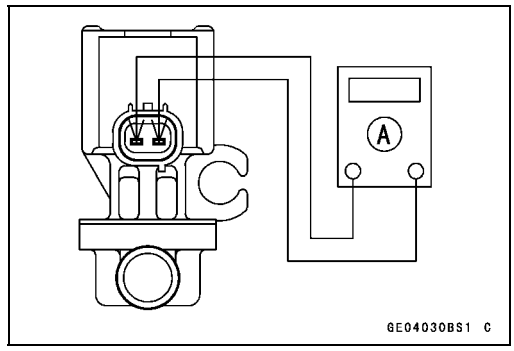
- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Air Switching Valve Unit Test

- Remove the air switching valve (see Air Switching Valve Removal in the Engine Top End chapter).
- Set the hand tester [A] to the × 1 Ω range and connect it to the air switching valve terminals as shown in the figure.

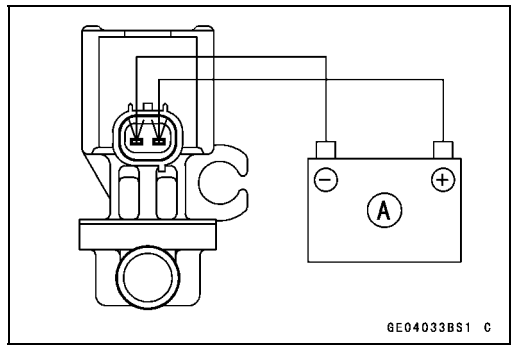
Special Tool - Hand Tester: 57001-1394

Air Switching Valve Resistance
Standard: 18 ~ 22 Ω at 20°C (68°F)

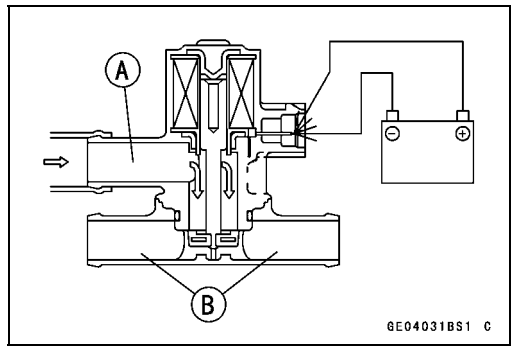


★If the tester does not read as specified value, replace it with a new one.

- Connect the 12 V battery [A] to the air switching valve terminals as shown in the figure.



- Blow the air to the intake air duct [A], and make sure does not flow the blown air from the outlet air ducts [B].

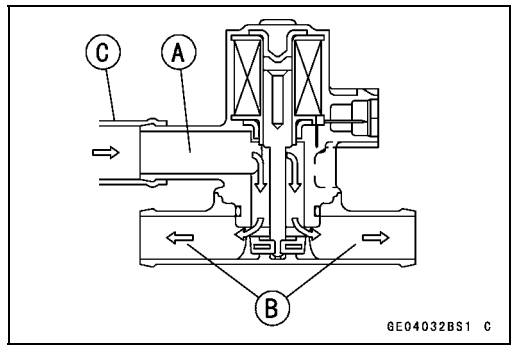


- Disconnect the 12 V battery.
- Blow the air to the intake air duct [A] again, and make sure flow the blown air from the outlet air ducts [B].

★If the air switching valve does not operate as described, replace it with a new one.

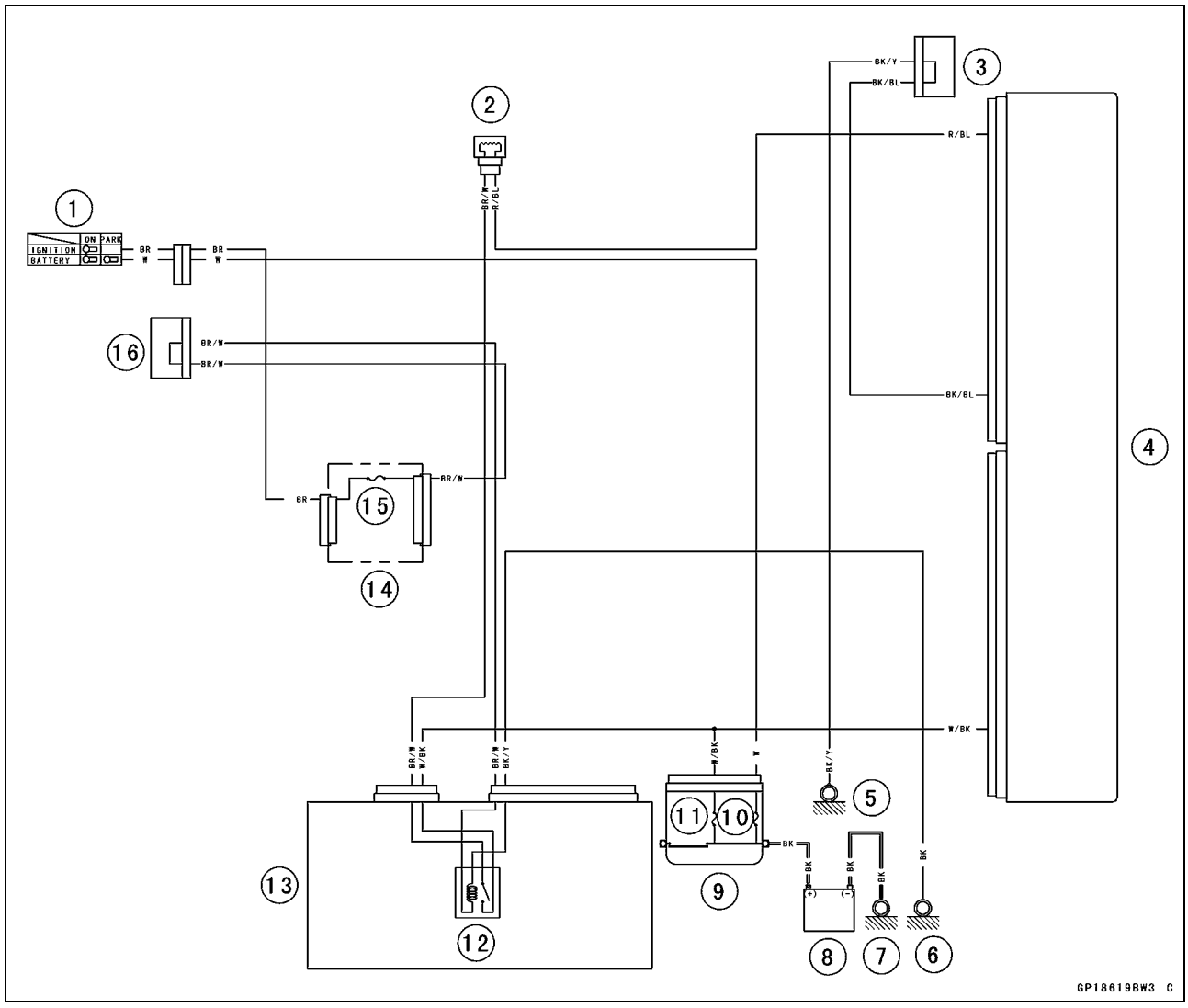
NOTE

○*To check air flow through the air switching valve, just blow through the air switching valve hose (intake side) [C].*



Air Switching Valve

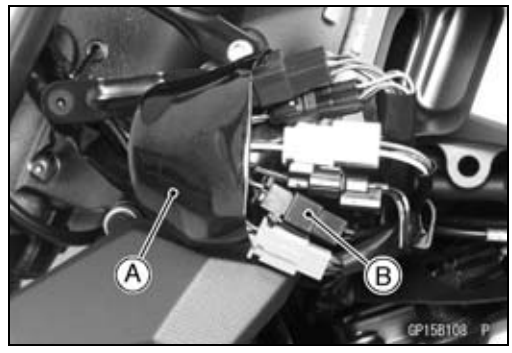
Air Switching Valve Circuit



1. Ignition Switch
2. Air Switching Valve
3. Joint Connector E
4. ECU
5. Frame Ground 1
6. Frame Ground 3
7. Engine Ground
8. Battery 12 V 8 Ah
9. Starter Relay
10. Main Fuse 30 A
11. ECU Fuse 15 A
12. ECU Main Relay
13. Relay Box
14. Fuse Box 1
15. Ignition Fuse 15 A
16. Joint Connector F

Radiator Fan System

Fan Motor Inspection

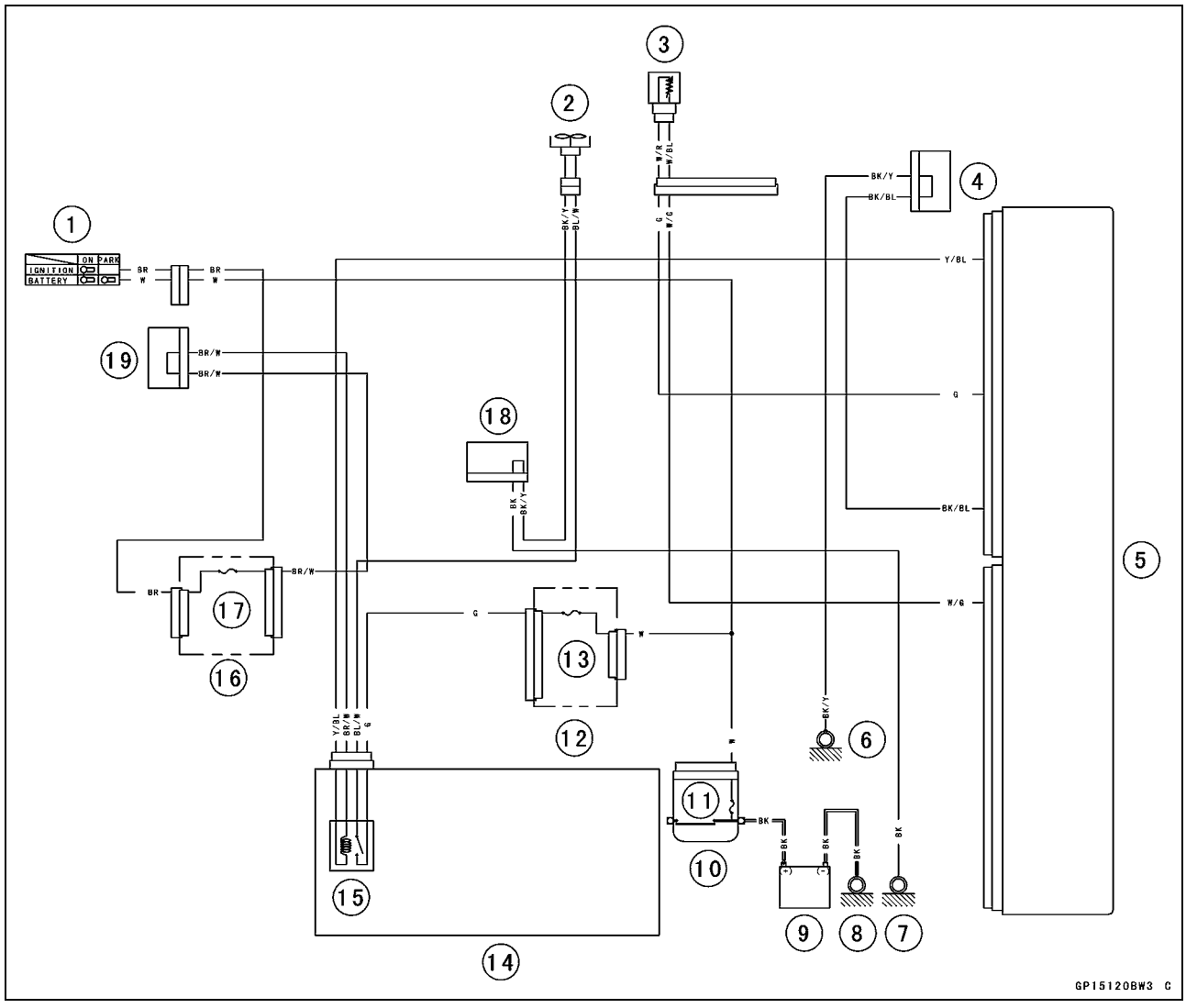


- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Slide the dust cover [A].
- Disconnect the connector [B].
- Using an auxiliary leads, supply battery power to the fan motor.

★If the fan does not rotate, the fan motor is defective and must be replaced.

Radiator Fan System

Radiator Fan Circuit



1. Ignition Switch
2. Fan Motor
3. Water Temperature Sensor
4. Joint Connector E
5. ECU
6. Frame Ground 1
7. Frame Ground 3
8. Engine Ground
9. Battery 12 V 8 Ah
10. Starter Relay
11. Main Fuse 30 A
12. Fuse Box 2
13. Fan Fuse 15 A
14. Relay Box
15. Radiator Fan Relay
16. Fuse Box 1
17. Ignition Fuse 15 A
18. Joint Connector C
19. Joint Connector F

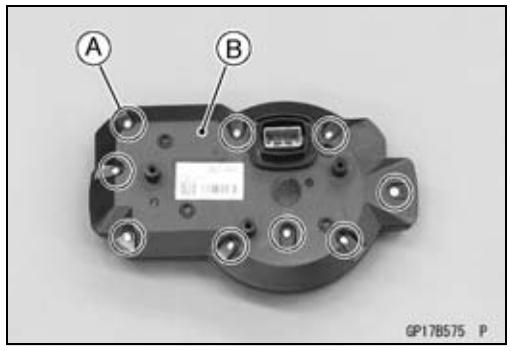
Meter, Gauge, Indicator Unit

Meter Unit Removal/Installation

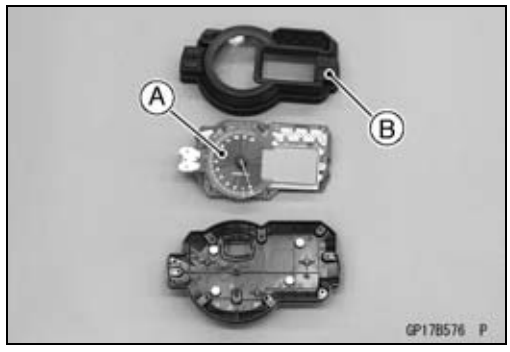
- Refer to the Meter Cover Removal/Installation in the Frame chapter.

Meter Unit Disassembly

- Remove:
  Meter Unit (see Meter Unit Removal/Installation)
  Screws [A]
  Lower Meter Cover [B]



- Separate the meter assembly [A] and upper meter cover [B].

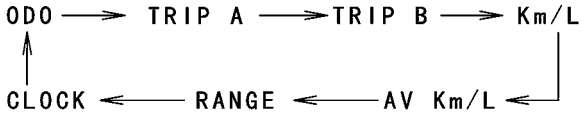


Meter Operation Inspection

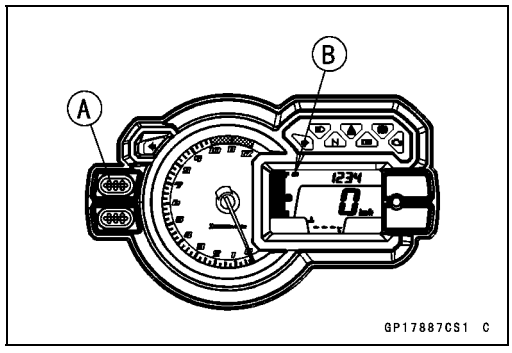
Check 1-1: Meter Unit Switching Inspection

- Turn the ignition switch to ON and check the following.
- By pushing the upper button [A] each time, check that the display [B] changes as follows.

○This display is ordinary indication.

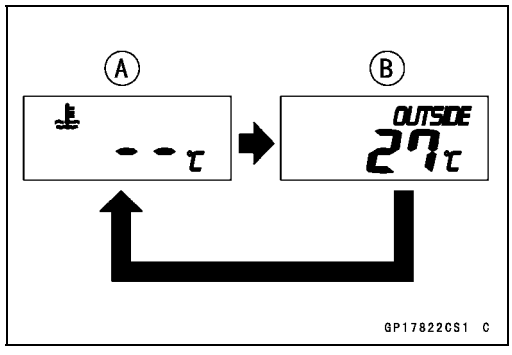


GP17821CN3 C



- By pushing the lower button each time, check that the display changes water temperature [A] and outside temperature [B].

★If the meter does not work, replace the meter unit.



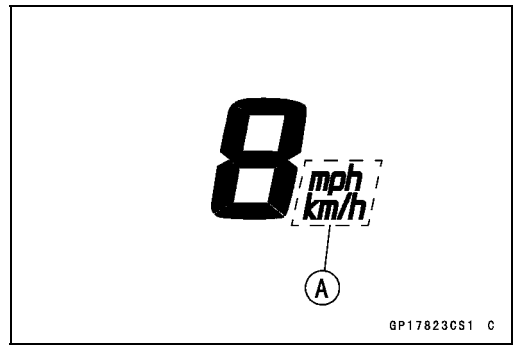
Meter, Gauge, Indicator Unit

● Indicate the ODO mode.
● Check that the display [A] changes to the “km/h” and “mph” display each time by pushing the lower button while upper button pushed in.

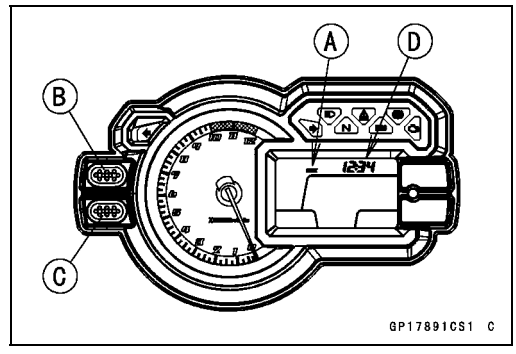
NOTE

○*Mile/Km Display can alternate between English and metric modes (mile and km) in the digital meter. Make sure that km or mile according to local regulations is correctly displayed before riding.*

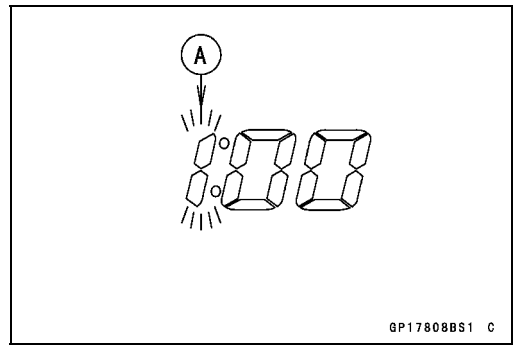
★If the display function does not work, replace the meter unit.



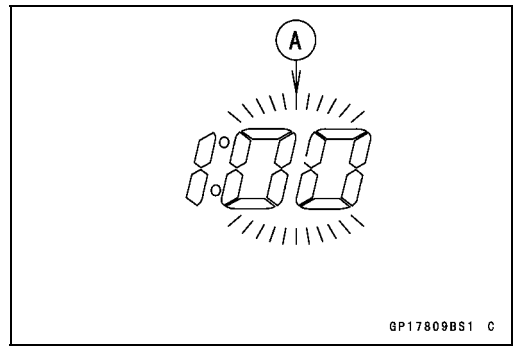
● Set the CLOCK mode [A] by pushing the upper button [B].
● Push the lower button [C] for more than two seconds.
○The clock setting menu (hour and minute) [D] should blink.
● Push the lower button.



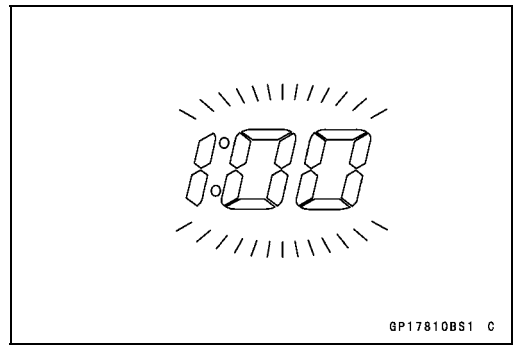
○The hour display [A] starts blinking.
● By pushing the upper button each time, check that the hour display changes.



● By pushing the lower button, check that the hour display decides and minute display [A] starts blinking.
● By pushing the upper button each time, check that the minute display changes.



● By pushing the lower button, check that the hour and minute display start blinking.
● By pushing the upper button, check that the hour and minute display decide.
● When both hour and minute display is blinking, by pushing the lower button, check that the hour display start blinking. This blinking returns the hour setting display.
★If the display function does not work, replace the meter unit.
○If the terminal 15 disconnected when the clock is setting, clock is set at time of that time.



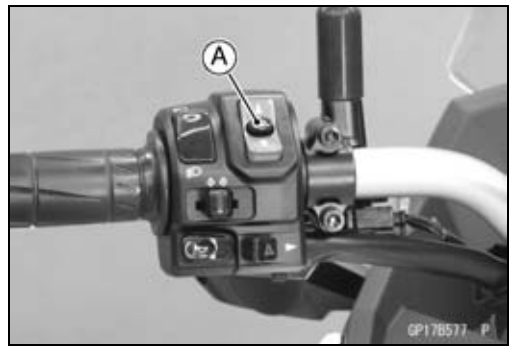
Meter, Gauge, Indicator Unit

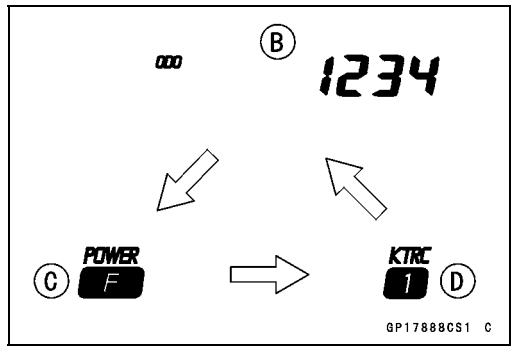
Check 1-2: Left Switch Housing Switching Inspection

- Turn the ignition switch to ON.
- By pushing the SEL button [A] each time, check that the display selects main display [B], power mode [C] and KTRC mode [D].

★If the display does not work, check the following parts.
SEL Button (see Switch Inspection)
Wiring (see Meter Unit Circuit)

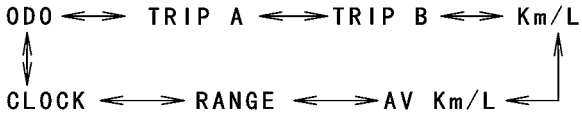
★If the above parts is good, replace the meter unit and/or ECU.

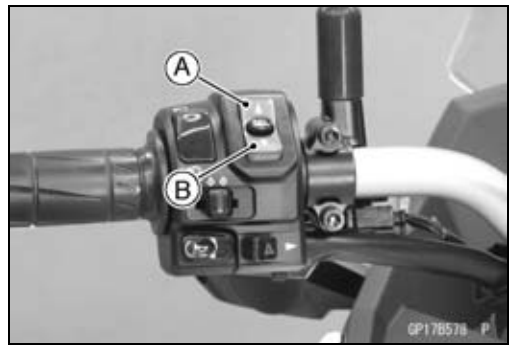




- Select the main display.
- By pushing the upper button [A] or lower button [B] each time, check that the display [C] changes as follows.

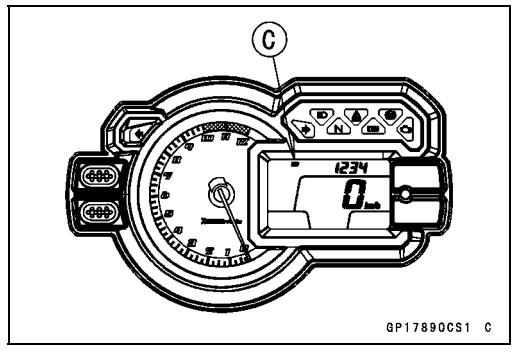
○This display is ordinary indication.





★If the display function does not work, check the following parts.
Upper Button or Lower Button (see Switch Inspection)
Wiring (see Meter Unit Circuit)

★If the above parts is good, replace the meter unit.

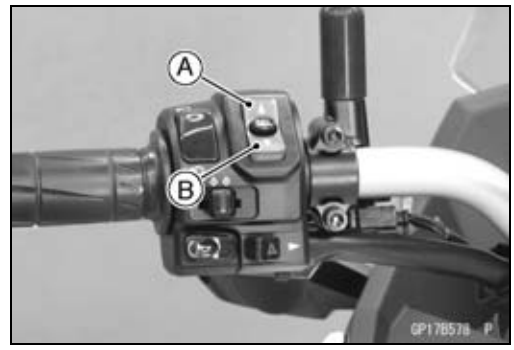


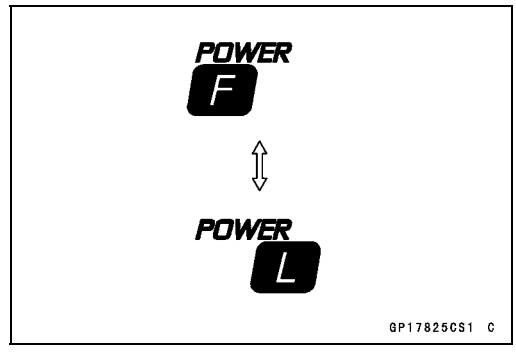
Meter, Gauge, Indicator Unit

- Select the power mode.
- By pushing the upper button [A] or lower button [B] each time, check that the power mode symbol changes to going on.

★If the display function does not work, check the following parts.
Upper Button or Lower Button (see Switch Inspection)
Wiring (see Meter Unit Circuit)

★If the above parts is good, replace the meter unit.

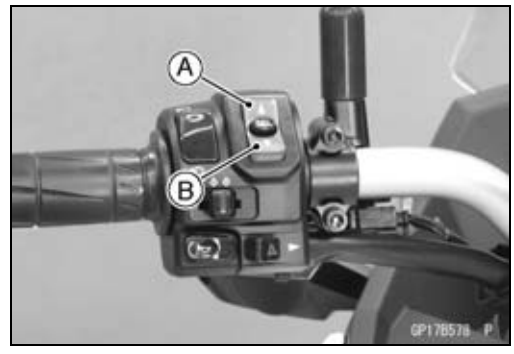


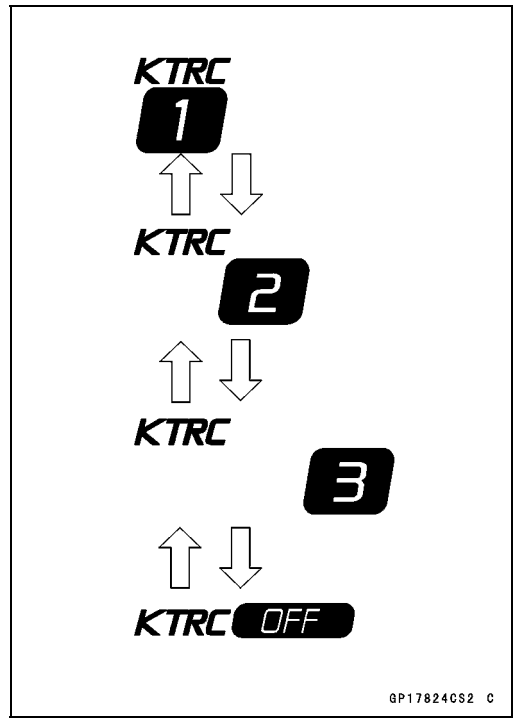


- Select the KTRC mode.
- By pushing the upper button [A] or lower button [B] each time, check that the KTRC indicator symbol changes to going on.

★If the indicator symbol does not work, check the following parts.
Upper Button or Lower Button (see Switch Inspection)
Wiring (see Meter Unit Circuit)

★If the above parts is good, replace the meter unit.





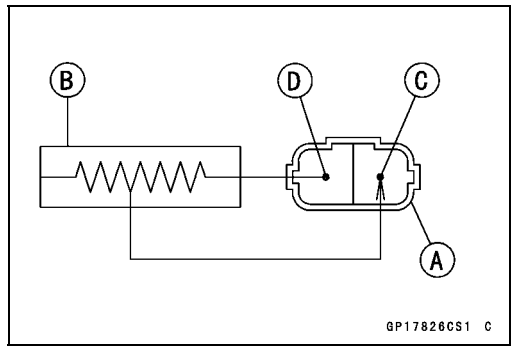
Meter, Gauge, Indicator Unit

Meter System Inspection

Check 2-1: Outside Temperature Inspection

- Disconnect the outside temperature sensor connector [A] (see Outside Temperature Sensor Removal).
- Connect the variable rheostat [B] to the BK/Y lead [C] and BL/R lead [D] terminals.

Temperature	Resistance (kΩ)
0°C (32°F)	5.4 ~ 6.6
80°C (176°F)	0.29 ~ 0.39



- Turn the ignition switch to ON.
- Read the temperature in the display.

○The display range is –20 ~ 140°C (–4 ~ 284°F).

★If the temperature is out of the range, the indication fixes the minimum value or maximum value.

○When the speed is 20 km/h (12 mph) or less and rising the temperature, the indication fixes the value of just before the indication.

★If the display function does not work, check the wiring (see Meter Unit Circuit).

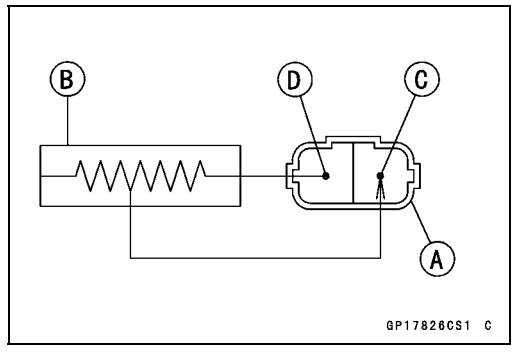
★If the wiring is good, replace the meter unit.

Check 2-2: Water Temperature Inspection

- Disconnect the water temperature sensor connector [A] (see Water Temperature Sensor Removal in the Fuel System (DFI) chapter).
- Connect the variable rheostat [B] to the W/R lead [C] and W/BL lead [D] terminals.

Temperature	Resistance (kΩ)
–20°C (–4°F)	*18.80 ±2.37
0°C (32°F)	*(about 6.544)
40°C (104°F)	1.136 ±0.095
100°C (212°F)	0.1553 ±0.0070

*: Reference Information



- Turn the ignition switch to ON.
- Read the temperature in the display.

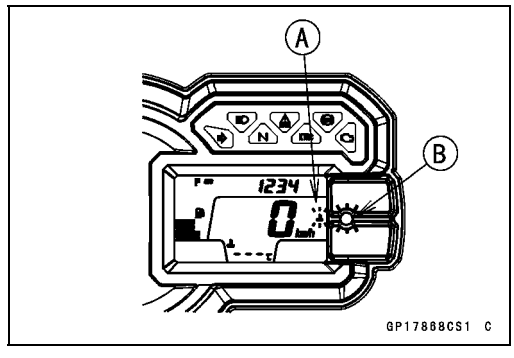
○The display range is 40 ~ 119°C (104 ~ 247°F).

★If the temperature is out of the range, the indication fixes the minimum value or maximum value.

- Disconnect the variable rheostat, the water temperature symbol [A] and red warning indicator [B] blinks.

★If the display function does not work, check the wiring (see Meter Unit Circuit).

★If the wiring is good, replace the meter unit.



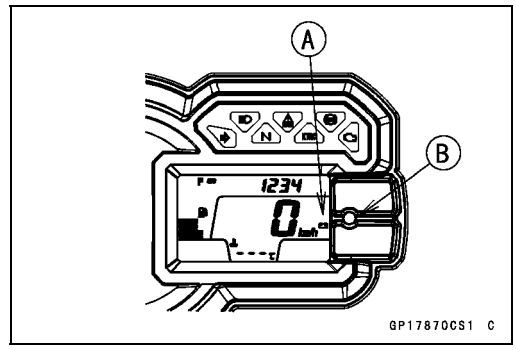
Meter, Gauge, Indicator Unit

Check 2-3: Battery Warning Indicator Inspection

- When the battery condition is low voltage (10.8 ~ 11.2 V or less), the battery symbol [A] and red warning indicator light (LED) [B] goes on.

★If the battery symbol and red warning indicator light (LED) goes on, charge the battery (see Refreshing Charge).

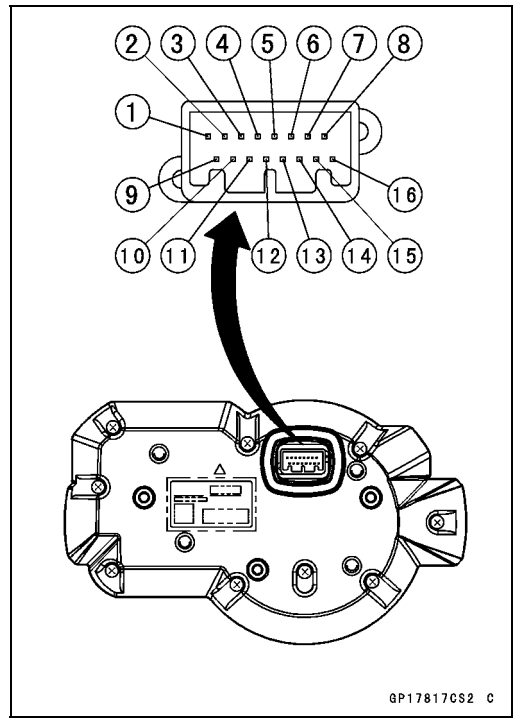
★If the battery condition is good, replace the meter unit.



Meter Unit Inspection

- Remove the meter unit (see Meter Unit Removal).

[1] Yellow ABS Indicator Light (LED) (–)
[2] Green Neutral Indicator Light (LED) Ground (–)
[3] Blue High Beam Indicator Light (LED) (+)
[4] Green Right Turn Signal indicator Light (LED) (+)
[5] Yellow KTRC Indicator Light (LED) (–)
[6] Ignition
[7] Battery (+)
[8] Green Left Turn Signal indicator Light (LED) (+)
[9] ECU Communication Pulse
[10] Speed Sensor Pulse
[11] Tachometer Pulse
[12] Fuel Level Sensor
[13] Red Warning Indicator Light (LED, Oil Pressure Warning) (–)
[14] Left Switch Housing Upper Button (–)
[15] Left Switch Housing Lower Button (–)
[16] Ground (–)



NOTICE

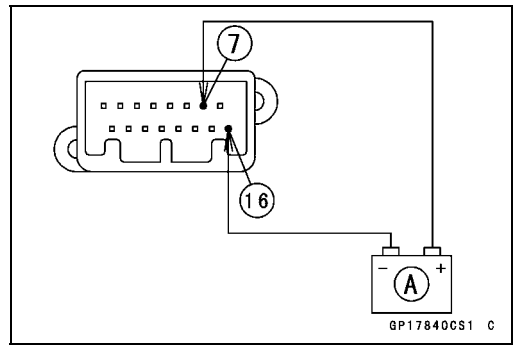
Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter unit is left upside down or sideways for a long time or dropped, it will malfunction. Do not short each terminals.

Check 3-1: Meter Unit Primary Operation Check

- Using the auxiliary leads, the 12 V battery [A] to the meter unit connector as follows.

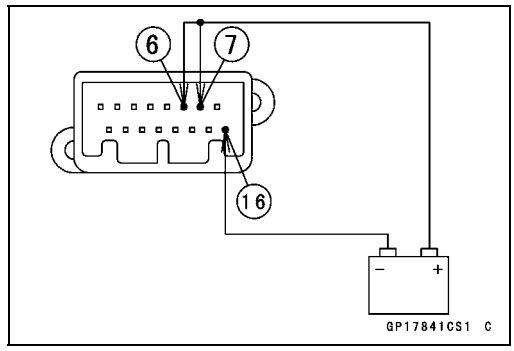
○Connect the battery positive (+) terminal to the terminal [7].

○Connect the battery negative (–) terminal to the terminal [16].

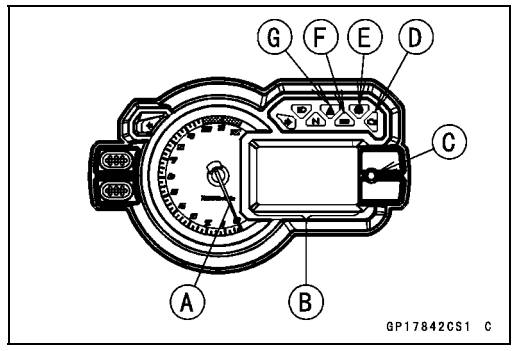


Meter, Gauge, Indicator Unit

● Connect the terminal [6] to the battery (+) terminal.



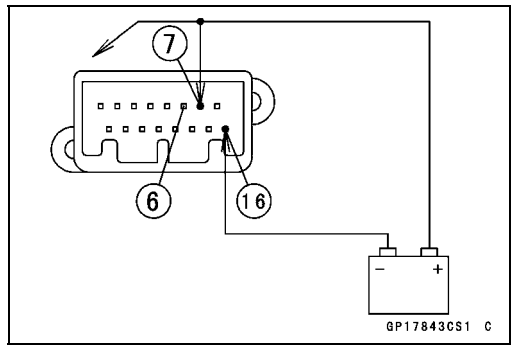
● Check the following items.
○The tachometer needle [A] momentarily points their last readings and back to the minimum position.
○All the LCD (Liquid Crystal Display) segments [B] appear for about 1 second.
○The red warning indicator light (LED) [C] goes on for 2 seconds.
○The yellow engine warning indicator light (LED) [D] goes on for 2 seconds.
○The yellow ABS warning indicator light (LED) [E] goes on.
○The yellow KTRC indicator light (LED) [F] goes on for 2 seconds.
○The yellow KTRC warning indicator light (LED) [G] goes on.
○The all segments of the fuel gauge in the display will blink. (This function is Fuel Level Sensor Line Self-Diagnosis Mode. Refer to Fuel Level Sensor Line Self-Diagnosis Mode Inspection.)
★If the meter unit does not work, replace the meter unit.
● Refer to the following indicator light inspection for other indicator lights (LED) inspection.



NOTE

○*Currently, the wiring that relates to blinking has been disconnected for the meter is removed from main harness. Therefore, the above blink has occurred.*

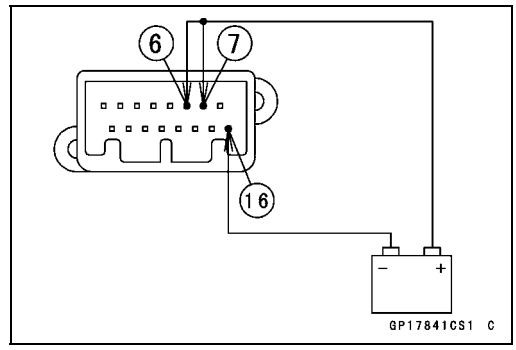
● Disconnect the terminal [6].
○All the LCD segments and LED warning indicator lights disappear.
★If the meter unit does not work, replace the meter unit.



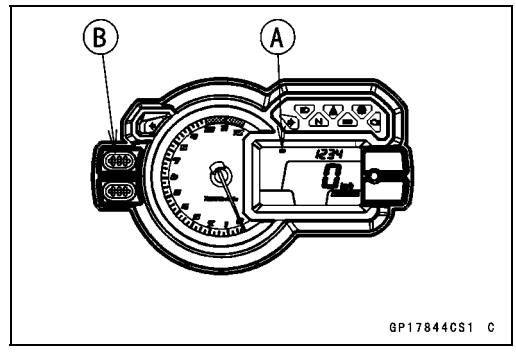
Meter, Gauge, Indicator Unit

Check 3-2: Meter Communication Line (Service Code 39) Check

- Connect the leads in the same circuit as Check 3-1.
- Wait 10 seconds and the yellow engine warning indicator light (LED) goes on.



- Set the ODO mode [A] by pushing the upper button [B].
- Push the upper button for more than 2 seconds.



- Check the following items.

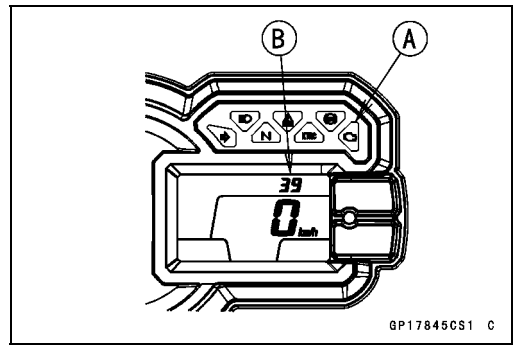
○The yellow engine warning indicator light (LED) [A] remains on and the number 39 [B] in the display appears.

- Push the upper button for more than 2 seconds.
- Check the following items.

○The display returns ODO mode from number 39.

○The yellow engine warning indicator light (LED) remains on.

★If the meter unit does not work, replace the meter unit.



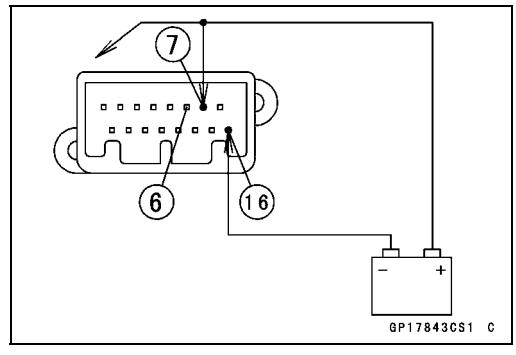
NOTE

○*The number 39 is service code of Self-Diagnosis (see Fuel System chapter). It is the service code of the meter communication line error.*

○*The number 39 in the display disappear when the meter unit is connected to main harness of the normal motorcycle.*

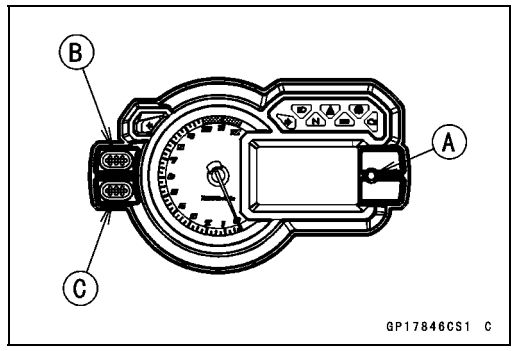
Check 3-3: Immobilizer Blinking Mode Inspection (Equipped Models)

- Connect the leads in the same circuit as Check 3-1.
- Disconnect the terminal [6].



Meter, Gauge, Indicator Unit

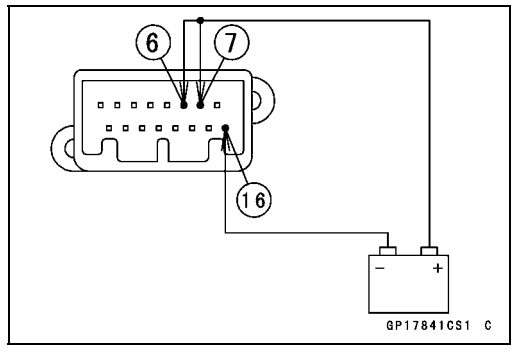
- Check that the red warning indicator light (LED) [A] starts blinking (Immobilizer Warning Indicator Light Blinking Mode).
- Push the upper [B] and lower [C] buttons more than 2 second, within 20 seconds after the terminal [6] disconnected.
- Check that the red warning indicator light (LED) goes on one second, and then the light goes off (Immobilizer Warning Indicator Light No Blinking Mode).



NOTE

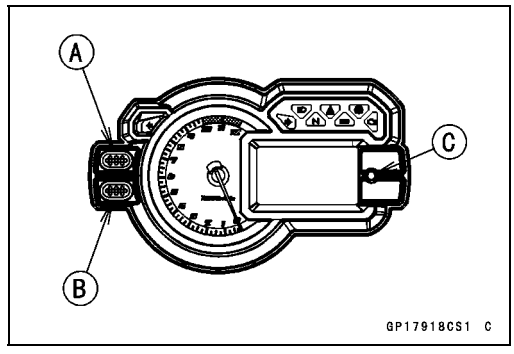
○*For this inspection, be sure the battery is 12.2 V or more. Immobilizer Warning Indicator Light Blinking Mode does not work, when the battery voltage is less than 12 ±0.2 V.*

- Connect the terminal [6] to the battery (+) terminal.
- And then, disconnect the terminal [6].



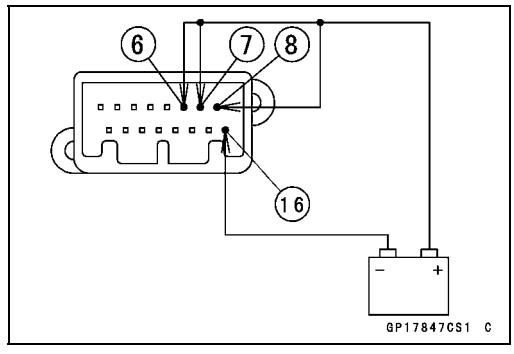
- Push the upper [A] and lower [B] buttons more than 2 second, within 20 seconds after the terminal [6] disconnected.
- Check that the red warning indicator light (LED) [C] goes on one second, and then the light starts blinking (Immobilizer Warning Indicator Light Blinking Mode).

★If the meter function does not work, replace the meter unit.



Check 3-4: Green Left Turn Signal Indicator Light (LED) Inspection

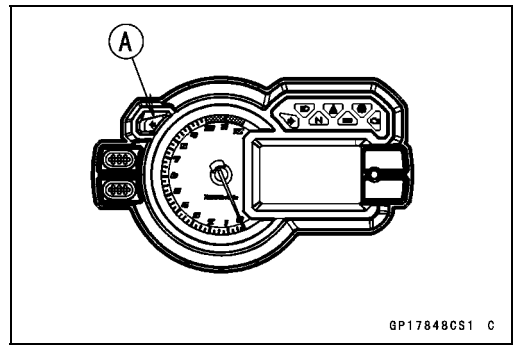
- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [8] to the battery (+) terminal.



Meter, Gauge, Indicator Unit

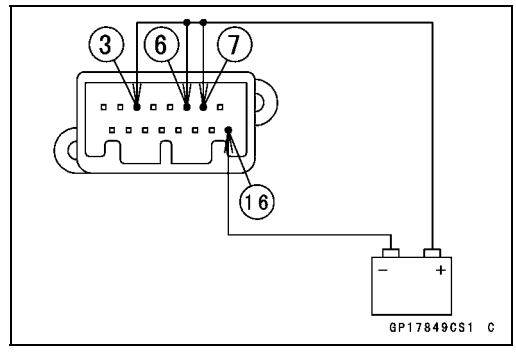
- Check that the green left turn signal indicator light (LED) [A] goes on.

★If the green left turn signal indicator light (LED) does not go on, replace the meter unit.



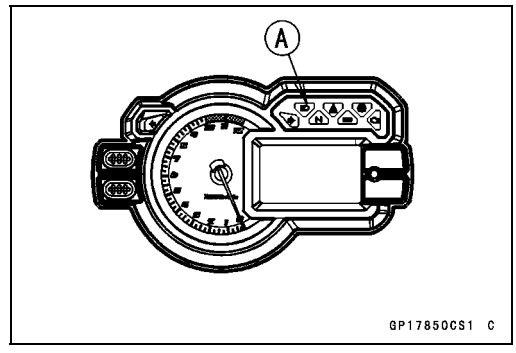
Check 3-5: Blue High Beam Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [3] to the battery (+) terminal.



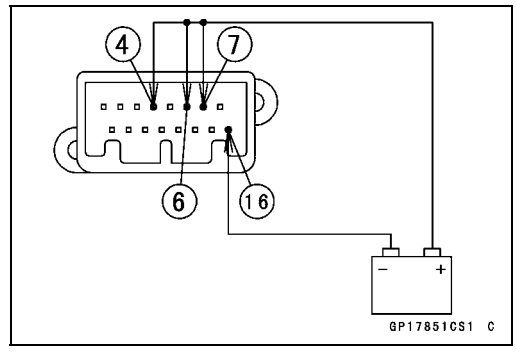
- Check that the blue high beam indicator light (LED) [A] goes on.

★If the blue high beam indicator light (LED) does not go on, replace the meter unit.



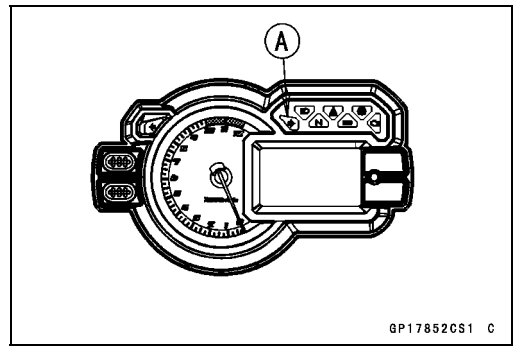
Check 3-6: Green Right Turn Signal Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [4] to the battery (+) terminal.



- Check that the green right turn signal indicator light (LED) [A] goes on.

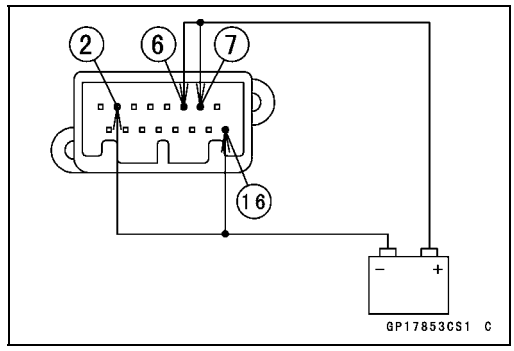
★If the green right turn signal indicator light (LED) does not go on, replace the meter unit.



Meter, Gauge, Indicator Unit

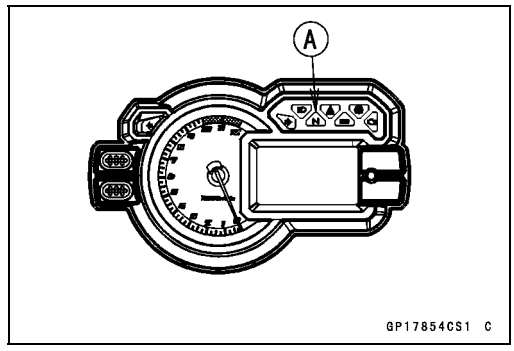
Check 3-7: Green Neutral Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [2] to the battery (–) terminal.



- Check that the green neutral indicator light (LED) [A] goes on.

★If the green neutral indicator light (LED) does not go on, replace the meter unit.

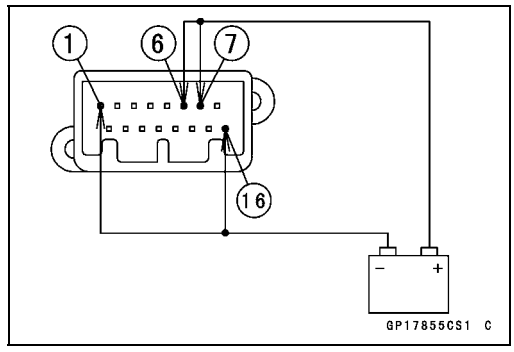


Check 3-8: Yellow ABS Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 3-1.

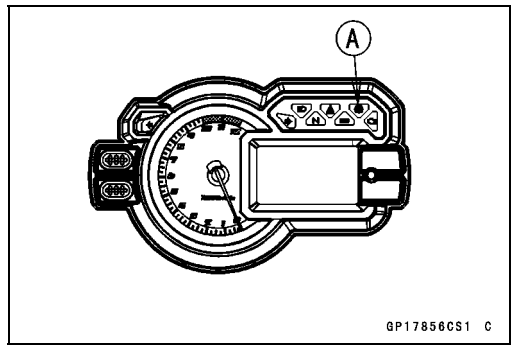
○The yellow ABS indicator light (LED) goes on.

- Connect the terminal [1] to the battery (–) terminal.



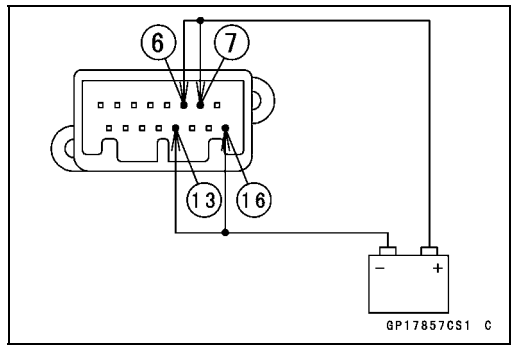
- Check that the yellow ABS indicator light (LED) [A] goes off.

★If the yellow ABS indicator light (LED) does not go off, replace the meter unit.



Check 3-9: Red Oil Pressure Warning Indicator Light (LED) Inspection

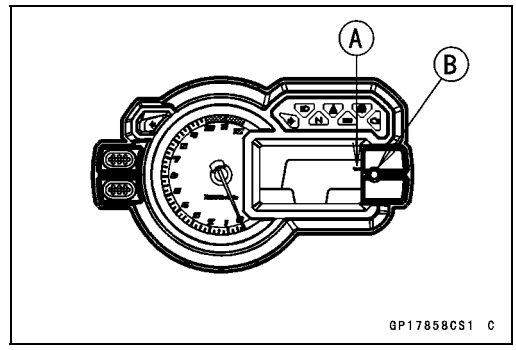
- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [13] to the battery (–) terminal.



Meter, Gauge, Indicator Unit

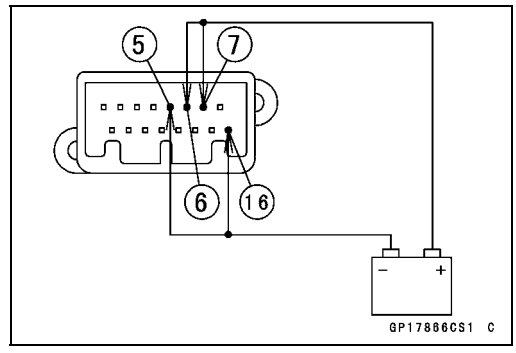
- Check that the oil symbol [A] and red oil pressure warning indicator light (LED) [B] goes on.

★If the oil symbol and red warning indicator light (LED) do not go on, replace the meter unit.



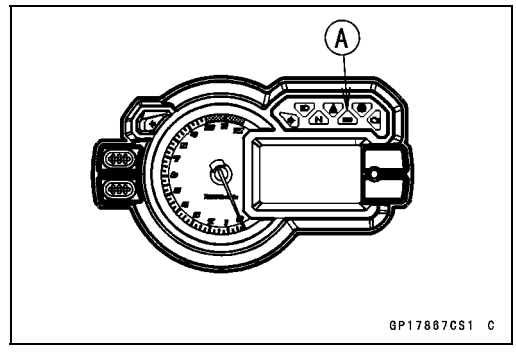
Check 3-10: Yellow KTRC Indicator Light (LED)

- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [5] to the battery (–) terminal.



- Check that the yellow KTRC indicator light (LED) [A] goes on.

★If the yellow KTRC indicator light (LED) does not go on, replace the meter unit.

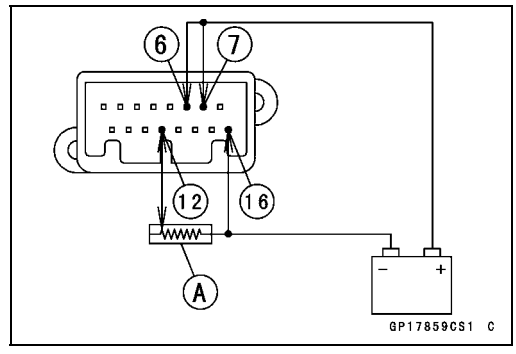


Check 3-11: Fuel Gauge Inspection

- Connect the leads in the same circuit as Check 3-1.

○The all segments of the fuel gauge in the display will blink.

- Connect the variable rheostat [A] to the terminal [12] and the battery (–) terminal.

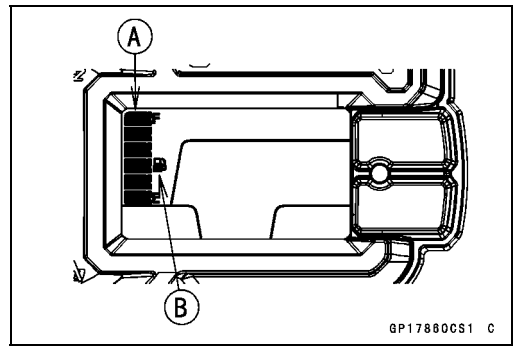


- Check that the segments number of the fuel level gauge [A] matches the resistance value of the variable rheostat.

○When the terminal [12] is connected, one segment in the fuel level gauge should appear about every 15 seconds.

Variable Rheostat Resistance (Ω)	Display Condition
20	6 segments go on
about 175	1 segment goes on
210	1 segment and Fuel Symbol [B] blink

★If the display function does not work, replace the meter unit.



Meter, Gauge, Indicator Unit

Check 3-12: Speedometer Inspection

- Connect the leads in the same circuit as Check 3-1.
- The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [10].

○Indicates approximately 60 km/h if the input frequency is approximately 388.4 Hz.

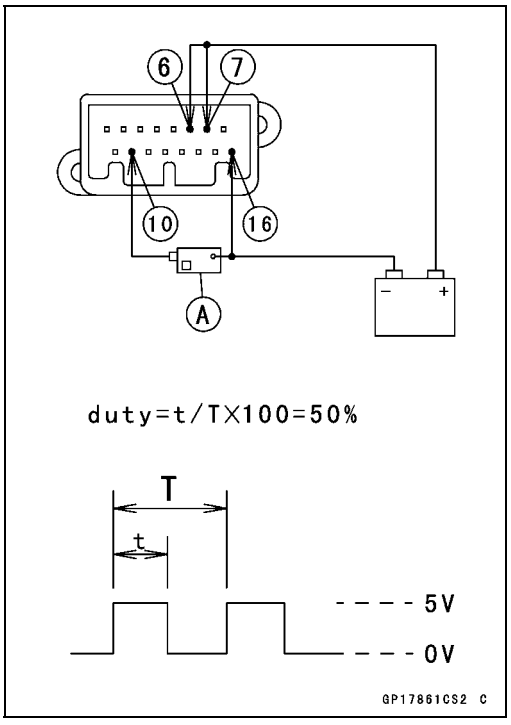
○Indicates approximately 60 mph if the input frequency is approximately 621.5 Hz.

★If the meter function does not work, replace the meter unit.

NOTE

○*The input frequency of the oscillator adds the integrated value of the odometer.*

○*The integrated value of the odometer cannot be reset.*



Check 3-13: Odometer Check

- Check the odometer with the speedometer check in the same way.

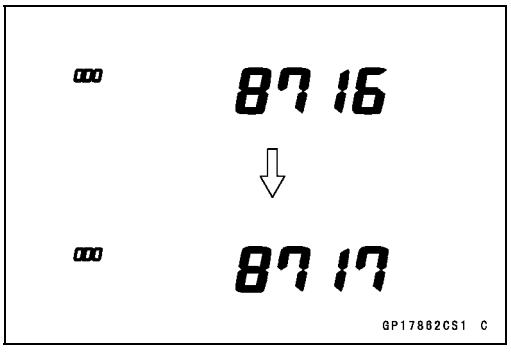
★If value indicated in the odometer is not added, replace the meter unit.

NOTE

○*The data is maintained even if the battery is disconnected.*

○*When the figures come to 999999, they are stopped and locked.*

○*The integrated value of the odometer cannot be reset.*



Check 3-14: Trip A/B Meter Check

- Check the trip meter with the speedometer in the same way.

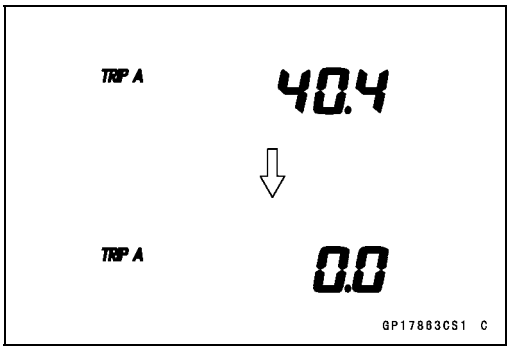
★If value indicated in the trip meter is not added, replace the meter unit.

NOTE

○*The integrated value of the odometer cannot be reset.*

- Check that when the lower button is pushed for more than two seconds, the figure display turns to 0.0.

★If the figure display does not indicate 0.0, replace the meter unit.



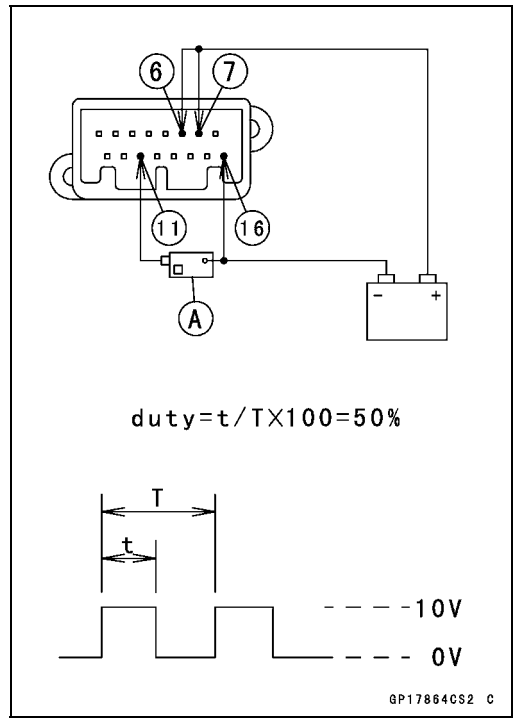
Meter, Gauge, Indicator Unit

Check 3-15: Tachometer Inspection

- Connect the leads in the same circuit as Check 3-1.
- The engine speed (rpm) equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [11].

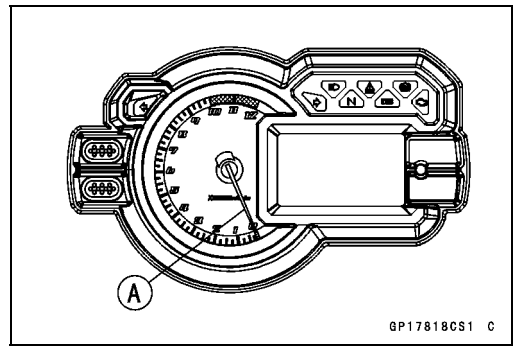
○Indicates approximately 6 000 rpm if the input frequency is approximately 200 Hz.

★If the meter function does not work, replace the meter unit.



- Disconnect the terminal [6].
- Check that the tachometer needle [A] back to the minimum (0) position.

★If the meter unit does not work, replace the meter unit.



Check 3-16: Other Inspection

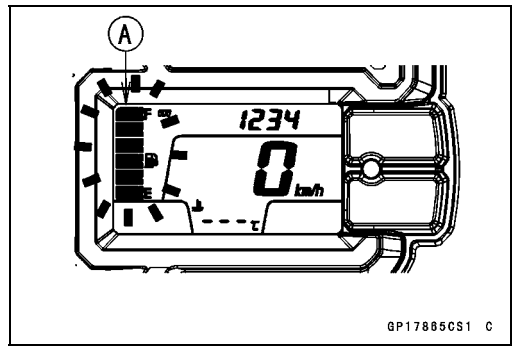
○The following items are displayed while running.
AVERAGE
CURRENT
RANGE

- When the above item is faulty indication check the following items.
Wiring (see Meter Circuit)
Fuel Injectors (see Fuel Injectors (Service Code 41, 42, 43, 44) section in the Fuel System (DFI) chapter)
Speed Sensor (see Speed Sensor (Service Code 24) section in the Fuel System (DFI) chapter)
Crankshaft Sensor (see Crankshaft Sensor Inspection)

★If the above items are good, replace the meter unit and/or ECU.

Meter, Gauge, Indicator Unit

Fuel Level Sensor Line Self-Diagnosis Mode Inspection



NOTE

○*Usually when the open or short of the fuel level sensor circuit is detected, it becomes the Fuel Level Sensor Line Self-Diagnosis Mode.*

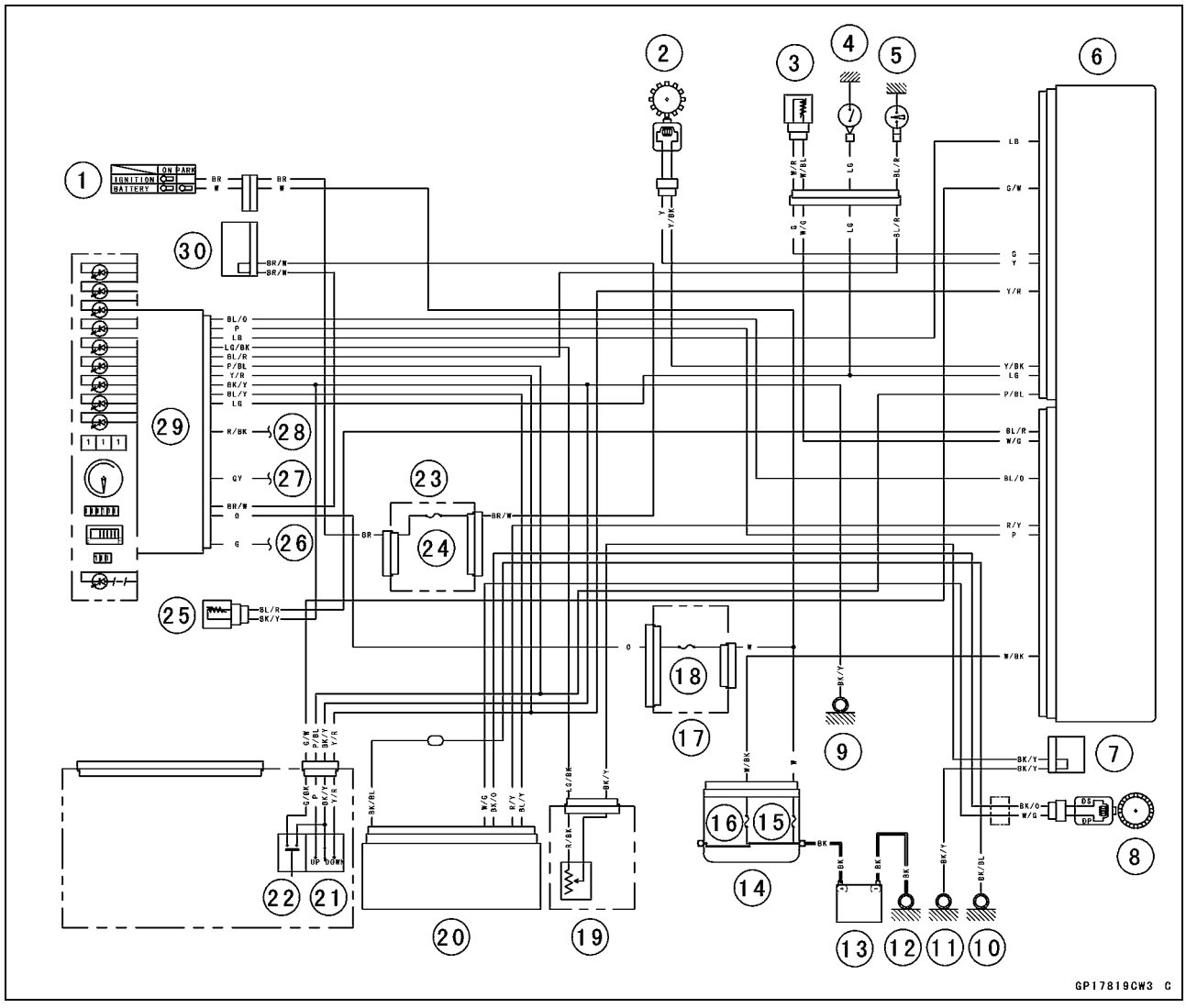
○The all segments of the fuel gauge [A] in the display will blink. (This function is Fuel Level Sensor Line Self-Diagnosis Mode.)

★If the meter enters the self-diagnostic mode when the meter is installed in the motorcycle, check the fuel level sensor (see Fuel Level Sensor Inspection) and wiring.

★If the fuel level sensor and wiring are good, replace the meter unit.

Meter, Gauge, Indicator Unit

Meter Circuit



1. Ignition Switch
2. Crankshaft Sensor
3. Water Temperature Sensor
4. Neutral Switch
5. Oil Pressure Switch
6. ECU
7. Joint Connector D
8. Rear Wheel Rotation Sensor
9. Frame Ground 1
10. Frame Ground 4
11. Frame Ground 2
12. Engine Ground
13. Battery 12 V 8 Ah
14. Starter Relay
15. Main Fuse 30 A
16. ECU Fuse 15 A
17. Fuse Box 2
18. Meter Fuse 7.5 A
19. Fuel Level Sensor
20. ABS Hydrauric Unit
21. Upper and Lower Button
22. SEL Button
23. Fuse Box 1
24. Ignition Fuse 15 A
25. Outside Temperature Sensor
26. to Turn Signal Switch (Left)
27. to Turn Signal Switch (Right)
28. to Dimmer Switch and Passing Button
29. Meter Unit
30. Joint Connector F

Immobilizer System (Equipped Models)

This motorcycle is equipped with an immobilizer system to protect the motorcycle from theft. This system provides a theft proof device by means of matching a code between the inbuilt key transponder and ECU (Electronic Control Unit). If the code does not match, ignition system, injectors and subthrottle valve actuator will not operate and the engine will not start.

Abstract

- Do not keep more than one immobilizer key of any system on a key ring. Jamming of the key code signal may occur and the operation of the system may be affected.
- The red warning indicator light (LED) will blink for a period of 24 hours once the ignition switch has been switched off and the key removed. This blinking can be set to on or off as desired by holding the left and right buttons down for two seconds within twenty seconds of switching the ignition off.
- If all coded keys are lost the ECU and ignition switch will have to be replaced.
- The immobilizer system can not function until the ignition key code is registered in the ECU.
- A total of five keys can be registered in the ECU at any one time.

Operational Cautions

1. Do not put two keys of any immobilizer system on the same key ring.
2. Do not submerge any key in water.
3. Do not expose any key to excessively high temperature.
4. Do not place any key close to magnet.
5. Do not place a heavy item on any key.
6. Do not grind any key or alter its shape.
7. Do not disassemble the plastic part of any key.
8. Do not drop the key and/or apply any shocks to the key.
9. When a ignition key is lost, the user should go to his dealer to invalidate the lost key registration in the ECU.
10. When the all ignition key is lost, the user should go to his dealer and have a new ECU installed and register the ignition keys.

NOTE

○*No.9 and 10 are strongly recommended to the customer to ensure security of the motorcycle.*

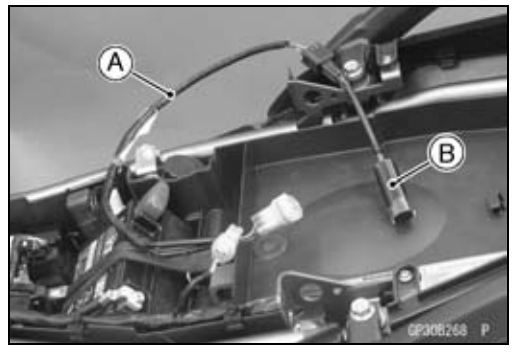
Key Registration

Case 1: When additional spare ignition key is required.

- Prepare a new spare ignition key.
- Cut the key in accordance with the shape of the current ignition key.
- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Remove the immobilizer/Kawasaki diagnostic system connector cap [A].

- Connect the key registration adapter [A] and key registration unit [B].

Special Tools - Key Registration Unit: 57001-1582
Key Registration Adapter: 57001-1746

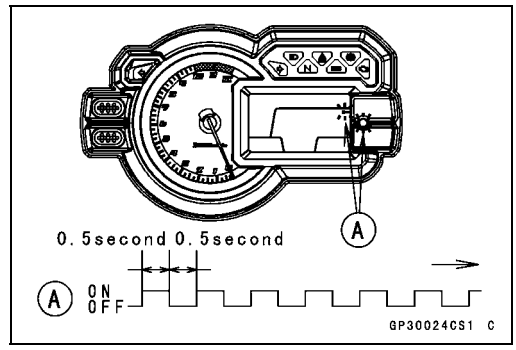


Immobilizer System (Equipped Models)

● Insert the registered ignition key into the ignition switch, and turn it to ON.

Verified

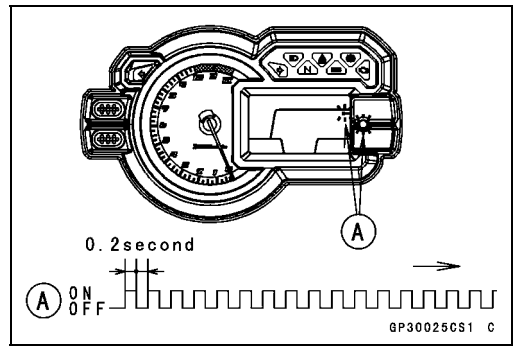
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the registration mode (go to the next step).



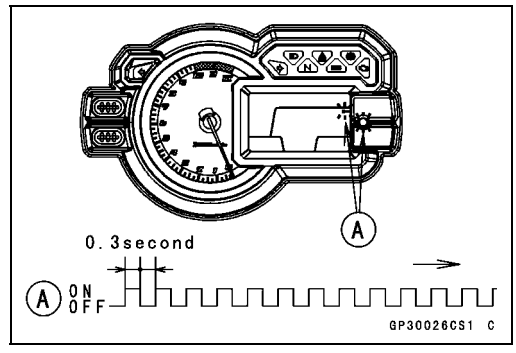
Not Verified

○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error (refer to the following failure illustrations).

Immobilizer Amplifier Failure



Registered Ignition Key Collation Error



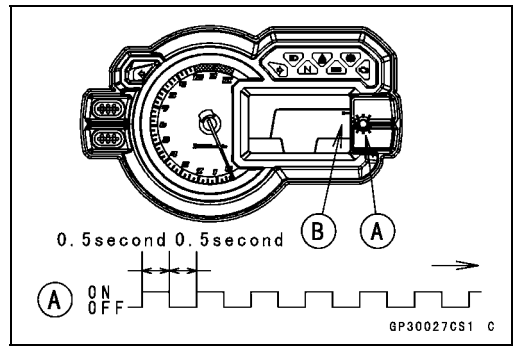
● Turn to OFF the ignition switch and remove the registered ignition key.

★If there are other registered ignition keys, they should all do the procedure above.

○The red warning indicator light (LED) [A] then blinks for 15 seconds; it means the ECU is in the registration mode.

○The immobilizer warning symbol [B] disappears.

○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).



NOTE

○*Insert and turn on the next key between 15 seconds that the ECU is in the registration mode.*

○*When a registration mode was ended, do the registered ignition key(s) verification procedure over again to restart it. This applies to all ignition key registration.*

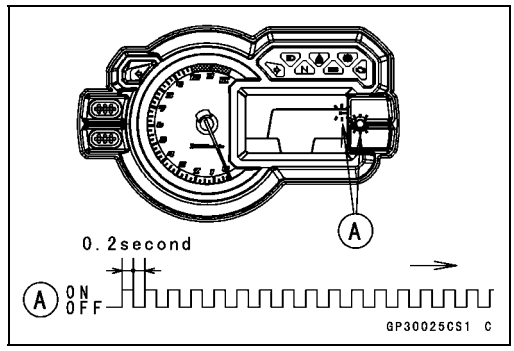
● Insert the ignition key 1 into the ignition switch, and turn it to ON.

NOTE

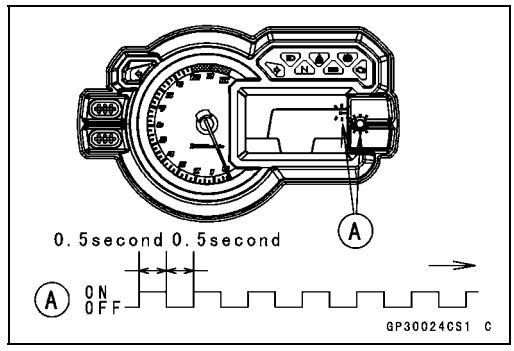
○*Keep other ignition keys away from the immobilizer antenna.*

Immobilizer System (Equipped Models)

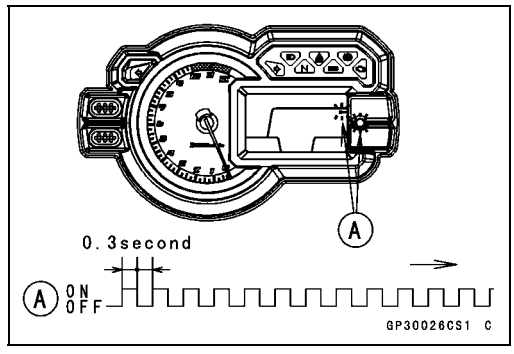
○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.
Immobilizer Amplifier Failure



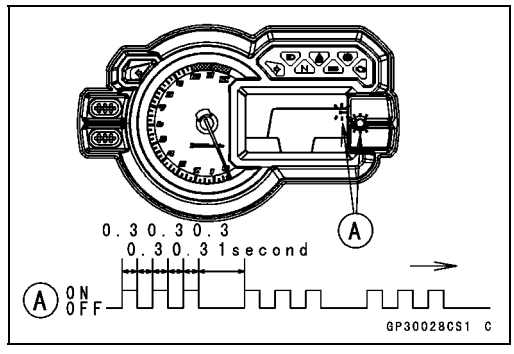
When Registered Ignition Key is Inserted.



Ignition Key Collation Error



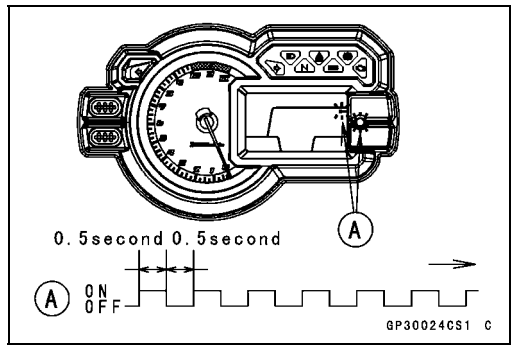
● The ignition key 1 is successfully registered in the ECU.
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 3 times and stop for 1 second and then repeat this cycle.



● Turn to OFF the ignition switch and remove the ignition key 1.
○The immobilizer warning symbol [A] disappears.
○The red warning indicator light (LED) then blinks for 15 seconds.
○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).

NOTE

○*This procedure registered the registered ignition key and one ignition key.*



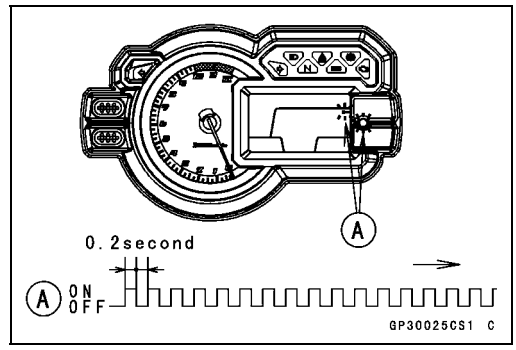
★If more keys registration is needed, go to next procedures within the registration mode.

Immobilizer System (Equipped Models)

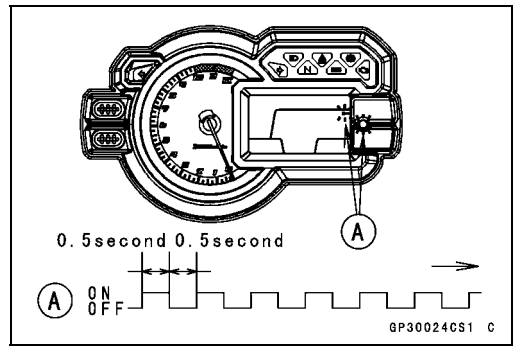
● Insert the ignition key 2 to the ignition switch and turn it to ON.

○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.

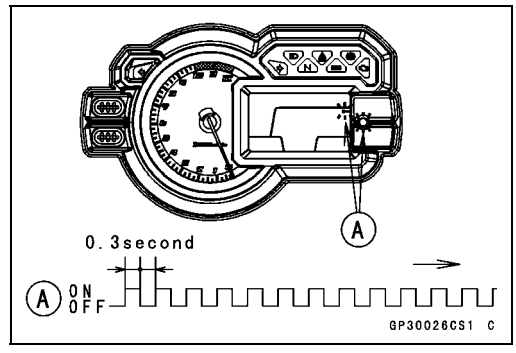
Immobilizer Amplifier Failure



When Registered Ignition Key is Inserted.



Ignition Key Collation Error

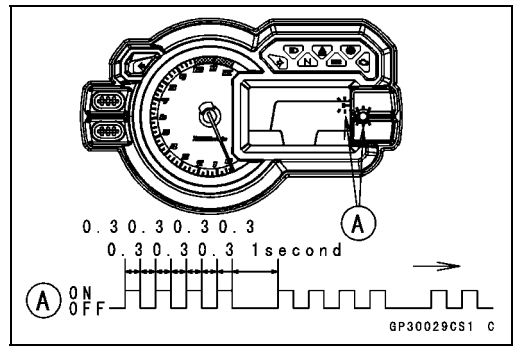


● The ignition key 2 is successfully registered in the ECU.

○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 4 times and stop for 1 second and then repeat this cycle.

○This procedure has registered the 2 ignition keys.

● Continue with the procedure if neccesary to register an additional one ignition key.



NOTE

○*The ECU can store up the five key codes.*

Ignition Key Indicator Blinks

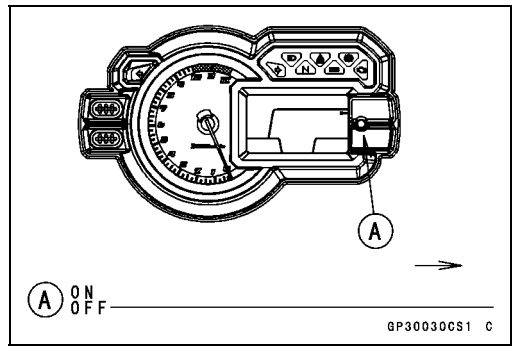
	Indicator Light Blinks	Indicator Light Stops	Remarks
Ignition Key 3	5 times	1 second	Repeat

● Turn to OFF the ignition switch and wait for period of more than 15 seconds.

● The registration mode automatically ends.

Immobilizer System (Equipped Models)

● The red warning indicator light (LED) [A] goes off.



● Remove the key registration unit, key registration adapter and install the immobilizer/Kawasaki diagnostic system connector cap.

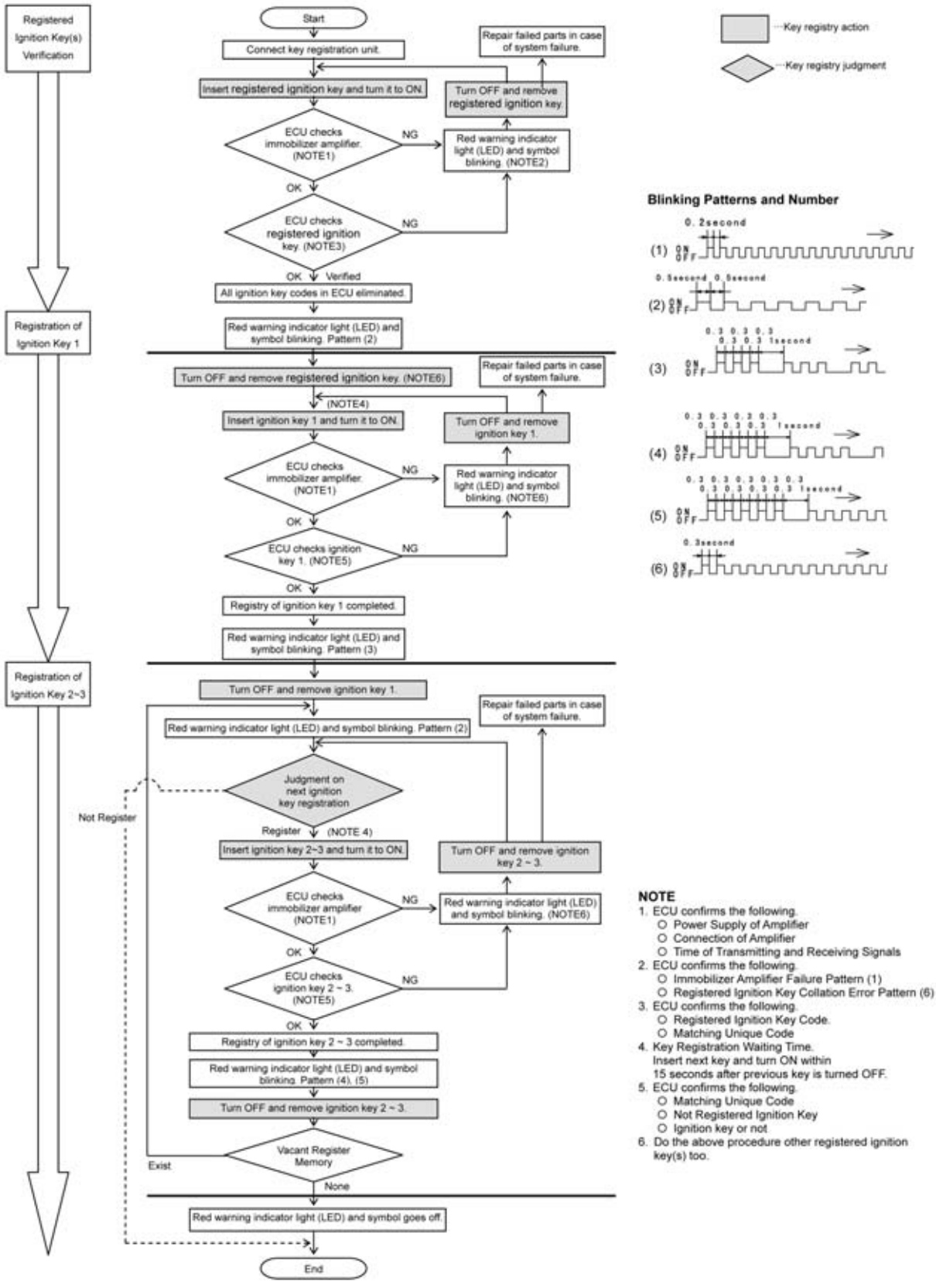
NOTE

○*Turn the ignition switch to ON with the registered ignition key.*

○*Check that the engine can be started using all registered ignition keys.*

Immobilizer System (Equipped Models)

Spare Ignition Key Registration Flow Chart


Registered Ignition Key(s) Verification
Registration of Ignition Key 1
Registration of Ignition Key 2~3
Start
Connect key registration unit.
Repair failed parts in case of system failure.
Insert registered ignition key and turn it to ON.
Turn OFF and remove registered ignition key.
ECU checks immobilizer amplifier. (NOTE1)
NG
Red warning indicator light (LED) and symbol blinking. (NOTE2)
OK
ECU checks registered ignition key. (NOTE3)
NG
OK
Verified
All ignition key codes in ECU eliminated.
Red warning indicator light (LED) and symbol blinking. Pattern (2)
Turn OFF and remove registered ignition key. (NOTE6)
Repair failed parts in case of system failure.
(NOTE4)
Insert ignition key 1 and turn it to ON.
Turn OFF and remove ignition key 1.
ECU checks immobilizer amplifier. (NOTE1)
NG
Red warning indicator light (LED) and symbol blinking. (NOTE6)
OK
ECU checks ignition key 1. (NOTE5)
NG
OK
Registry of ignition key 1 completed.
Red warning indicator light (LED) and symbol blinking. Pattern (3)
Turn OFF and remove ignition key 1.
Repair failed parts in case of system failure.
Red warning indicator light (LED) and symbol blinking. Pattern (2)
Judgment on next ignition key registration
Not Register
Register
(NOTE 4)
Insert ignition key 2~3 and turn it to ON.
Turn OFF and remove ignition key 2 ~ 3.
ECU checks immobilizer amplifier (NOTE1)
NG
Red warning indicator light (LED) and symbol blinking. (NOTE6)
OK
ECU checks ignition key 2 ~ 3. (NOTE5)
NG
OK
Registry of ignition key 2 ~ 3 completed.
Red warning indicator light (LED) and symbol blinking. Pattern (4), (5)
Turn OFF and remove ignition key 2 ~ 3.
Vacant Register Memory
Exist
None
Red warning indicator light (LED) and symbol goes off.
End
Key registry action
Key registry judgment
Blinking Patterns and Number
0.2second
(1)
0.5second 0.5second
(2)
0.3 0.3 0.3 0.3 0.3 1second
(3)
0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 1second
(4)
0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 1second
(5)
0.3second
(6)
ON
OFF

NOTE

1. ECU confirms the following.
   - O Power Supply of Amplifier
   - O Connection of Amplifier
   - O Time of Transmitting and Receiving Signals
2. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O Registered Ignition Key Collation Error Pattern (6)
3. ECU confirms the following.
   - O Registered Ignition Key Code.
   - O Matching Unique Code
4. Key Registration Waiting Time.
   Insert next key and turn ON within 15 seconds after previous key is turned OFF.
5. ECU confirms the following.
   - O Matching Unique Code
   - O Not Registered Ignition Key
   - O Ignition key or not
6. Do the above procedure other registered ignition key(s) too.

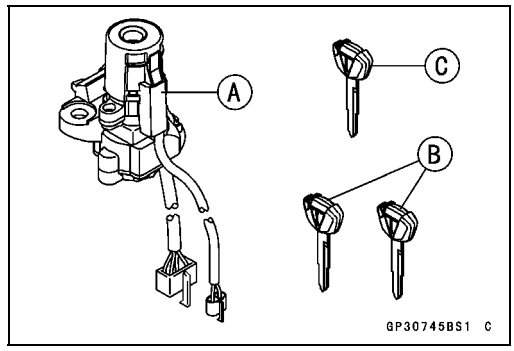
GP30051C F

Immobilizer System (Equipped Models)

Case 2: When the ignition switch is faulty and has to be replaced.

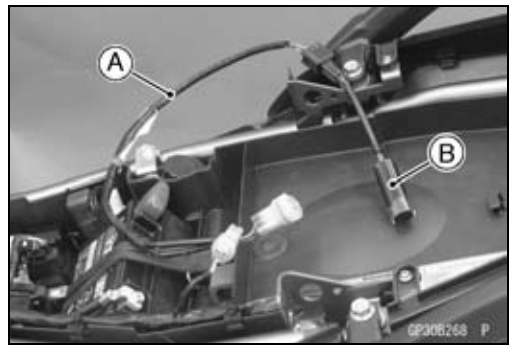
- Prepare a new ignition switch [A] and two new ignition keys [B].

○These parts are available as a set. Prepare the current registered ignition key [C].



- Remove:
  Ignition Switch (see Immobilizer System Parts Replacement)
  Seat (see Seat Removal in the Frame chapter)
- Remove the immobilizer/Kawasaki diagnostic system connector cap.
- Connect the key registration adapter [A] and key registration unit [B].

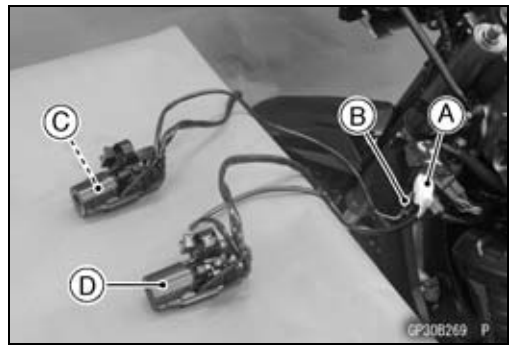
Special Tools - Key Registration Unit: 57001-1582
Key Registration Adapter: 57001-1746



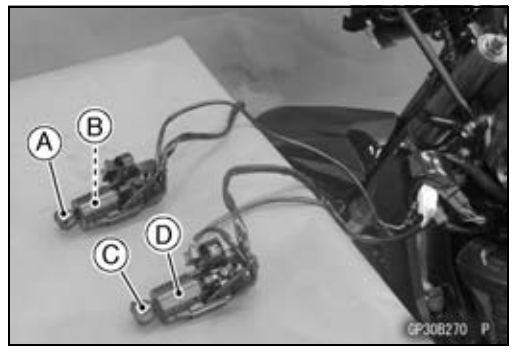
- Connect:
  New Ignition Switch Lead Connector [A]
  Immobilizer Antenna Lead Connector [B] (of Current Ignition Switch)

NOTE

○*Keep the antenna [C] more than 15 cm (5.9 in.) from the new ignition switch [D].*

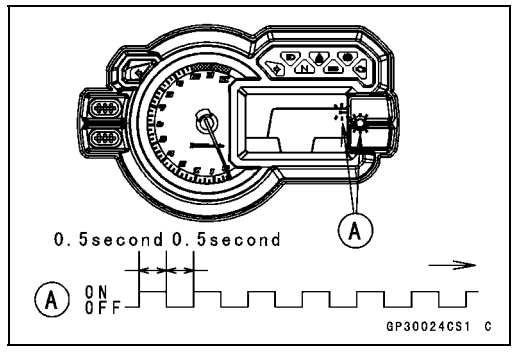


- Insert the current registered ignition key [A] into the current ignition switch [B].
- Insert the new ignition key 1 [C] into the new ignition switch [D], and turn it to ON.



Verified

○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the ECU is in the registration mode (go to the next step).

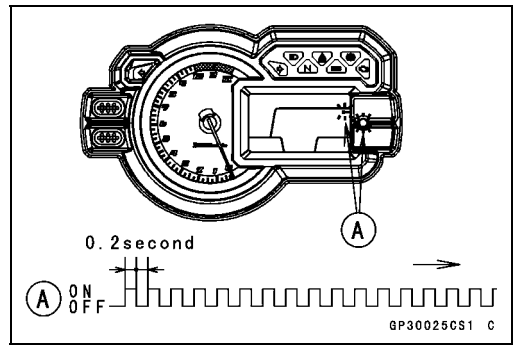


Immobilizer System (Equipped Models)

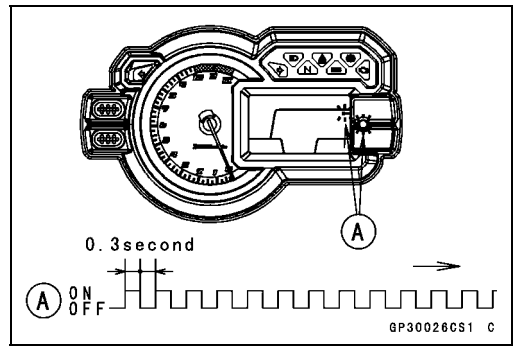
Not Verified

○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.

Immobilizer Amplifier Failure



Registered Ignition Key Collation Error

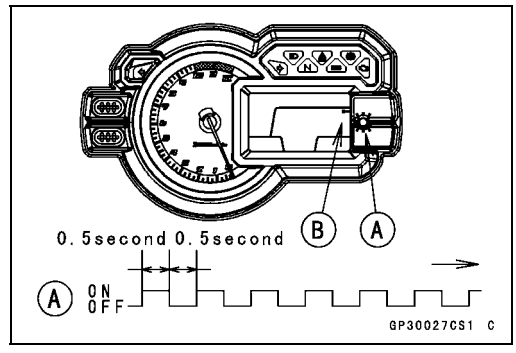


- Turn to OFF the ignition switch and remove the new ignition key 1.

○The immobilizer warning symbol [B] disappears.

○The red warning indicator light (LED) [A] then blinks for 15 seconds; it means the ECU is in the registration mode.

○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).



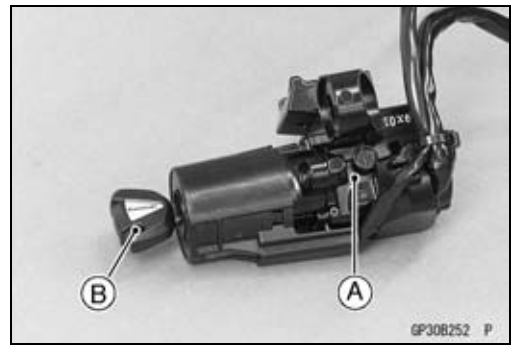
- Disconnect the antenna lead connector of the current ignition switch and connect the antenna lead connector of the new ignition switch [A].
- Insert the ignition key 1 [B] again into the new ignition switch, and turn it to ON.

NOTE

○*Insert and turn on the ignition key within 15 seconds that the ECU is in the registration mode.*

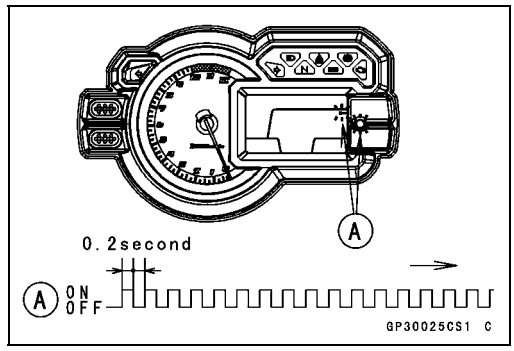
○*When a registration mode was ended, do the registered ignition key verification procedure over again to restart it. This applies to all ignition key registration.*

○*Keep other ignition keys away from the immobilizer antenna.*

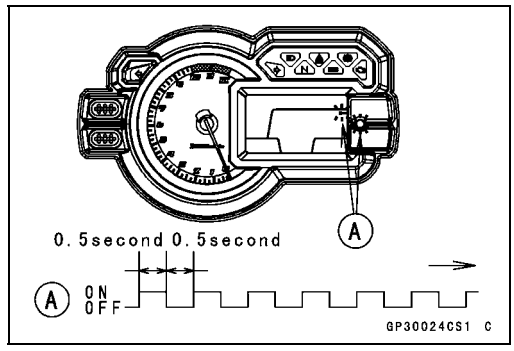


Immobilizer System (Equipped Models)

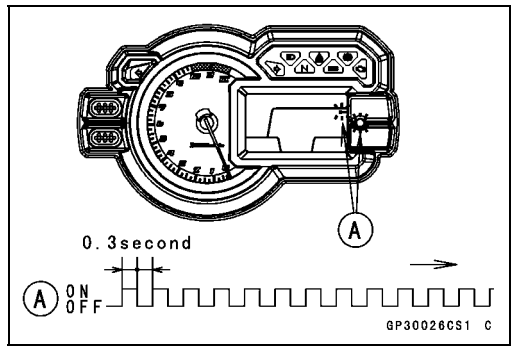
○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.
Immobilizer Amplifier Failure



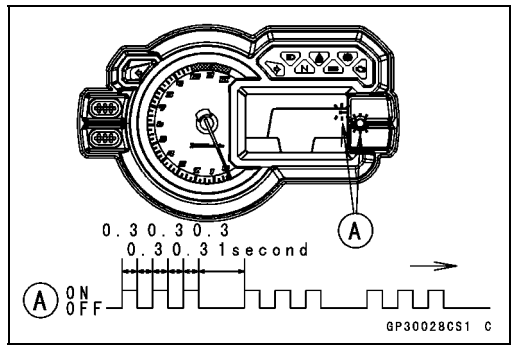
When Registered Ignition Key is Inserted.



Ignition Key Collation Error



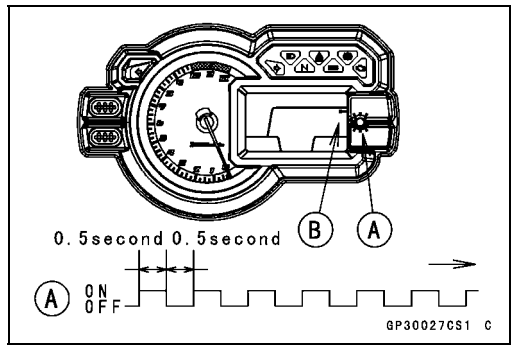
● The ignition key 1 is successfully registered in the ECU.
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 3 times and stop for 1 second and then repeat this cycle.



● Turn to OFF the ignition switch and remove the ignition key 1.
○The immobilizer warning symbol [B] disappears.
○The red warning indicator light (LED) [A] then blinks for 15 seconds.
○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).

NOTE

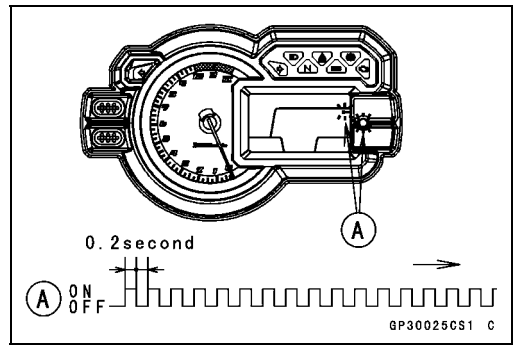
○*This procedure registered the registered ignition key and one ignition key.*



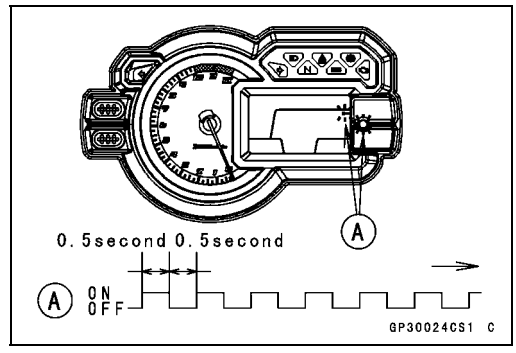
★If more keys registration is needed, go to next procedures within the registration mode.
● Insert the ignition key 2 into the ignition switch, and turn it to ON.

Immobilizer System (Equipped Models)

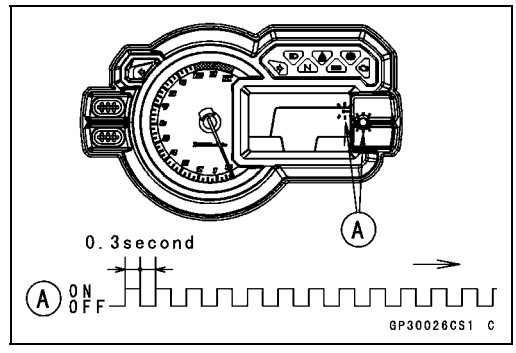
○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.
Immobilizer Amplifier Failure



When Registered Ignition Key is Inserted.



Ignition Key Collation Error

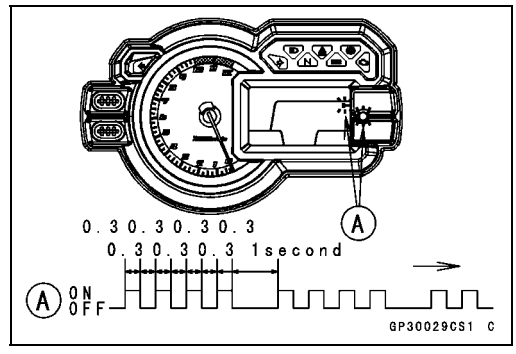


- The ignition key 2 is successfully registered in the ECU.

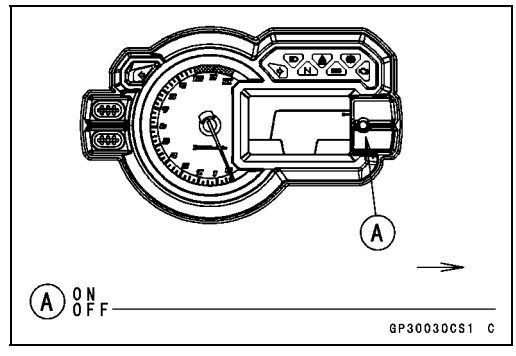
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 4 times and stop for 1 second and then repeat this cycle.

○This procedure has registered the registered ignition key and 2 ignition keys.

- Turn to OFF the ignition switch and wait for period of more than 15 seconds.
- The registration mode automatically ends.



- The red warning indicator light (LED) [A] goes off.



● Remove the key registration unit, key registration adapter and install the immobilizer/Kawasaki diagnostic system connector cap.

NOTE

○*Turn the ignition switch to ON with the registered ignition key.*

○*Check that the engine can be started using all registered ignition keys.*

● Install the new ignition switch (see Immobilizer System Parts Replacement).

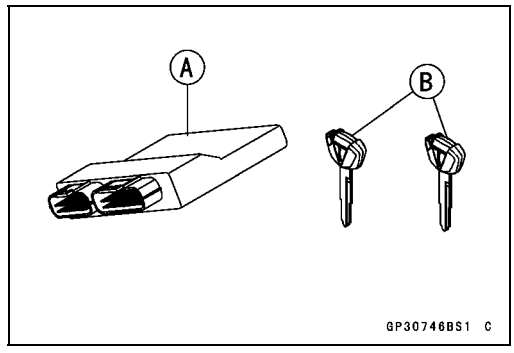
Case 3: When the ECU is faulty and has to be replaced.

● Prepare a new ECU [A] and current ignition key(s) [B].

NOTE

○*The key registration unit is not required.*

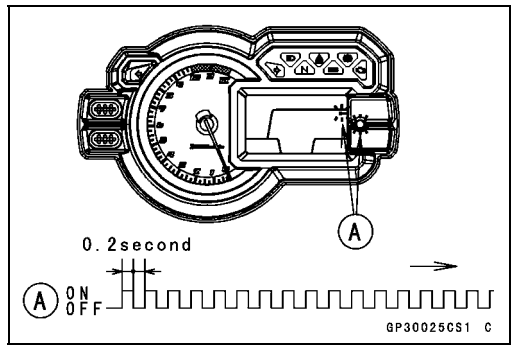
○*After replacing the ECU, be sure to register the 2 ignition keys. If the 2 keys are not registered, the engine can not be started.*



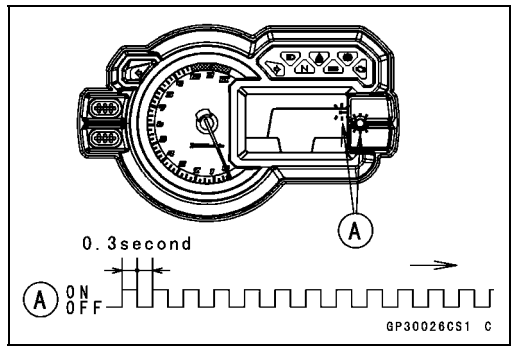
● Replace:
ECU (see Immobilizer System Parts Replacement)

● Insert the current registered ignition key into the ignition switch and turn it to ON.

○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.
Immobilizer Amplifier Failure

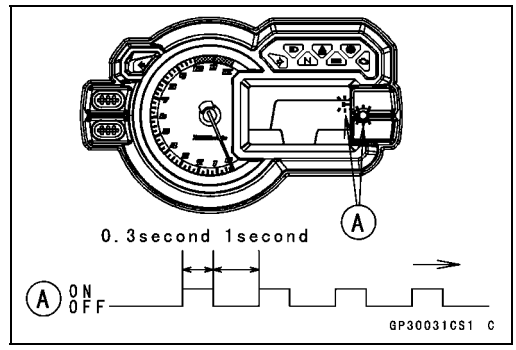


Registered Ignition Key Collation Error

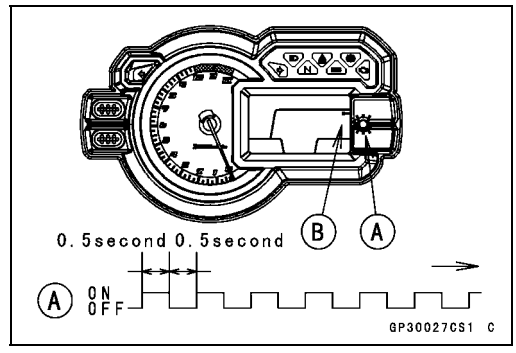


Immobilizer System (Equipped Models)

● The registered ignition key is successfully registered in the ECU.
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 1 time and stop for 1 second and then repeat this cycle.



● Turn to OFF the ignition switch and remove the registered ignition key.
○The immobilizer warning symbol [B] disappears.
○The red warning indicator light (LED) [A] then blinks for 15 seconds; it means the ECU is in the registration mode.
○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).



NOTE

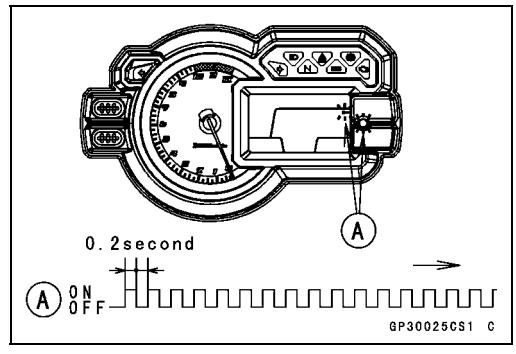
○*Insert and turn on the next key between 15 seconds that the ECU is in the registration mode.*
○*When a registration mode was ended, do the registered ignition key verification procedure over again to restart it. This applies to all ignition key registration.*

● Insert the other remaining registered ignition key into the ignition switch, and turn it to ON.

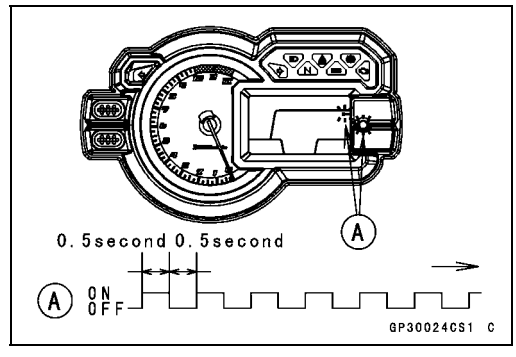
NOTE

○*Keep other ignition keys away from the immobilizer antenna.*

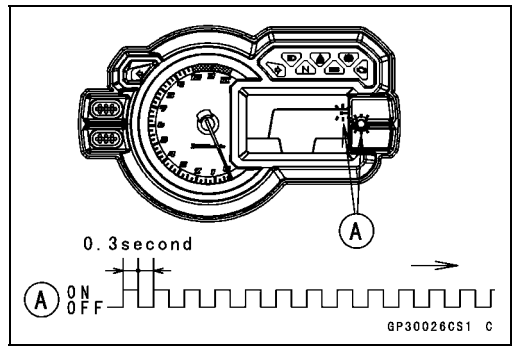
○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.
Immobilizer Amplifier Failure



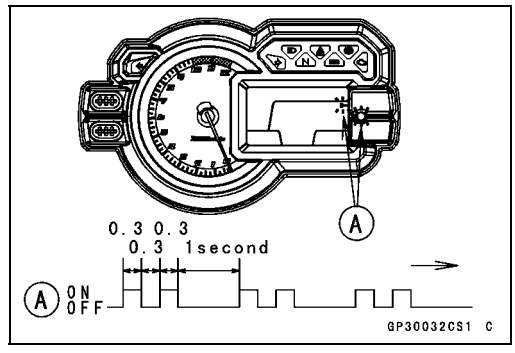
When Registered Ignition Key is Inserted.



Ignition Key Collation Error



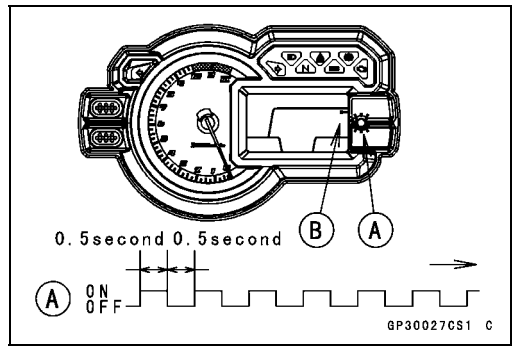
● The other remaining ignition key is registered in the ECU.
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 2 times and stop for 1 second and then repeat this cycle.



● Turn to OFF the ignition switch and remove the other remaining ignition key.
○The immobilizer warning symbol [B] disappears.
○The red warning indicator light (LED) [A] then blinks for 15 seconds.
○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).

NOTE

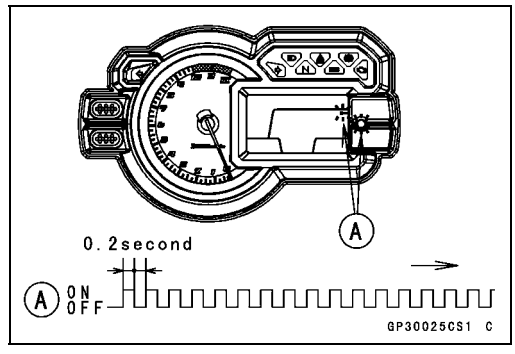
○*This procedure registered the registered ignition key and one ignition key.*



★If more keys registration is needed, go to next procedures within the registration mode.

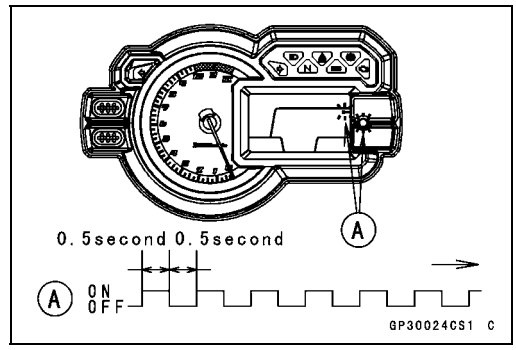
● Insert the ignition key 1 into the ignition switch, and turn it to ON.

○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error code.
Immobilizer Amplifier Failure

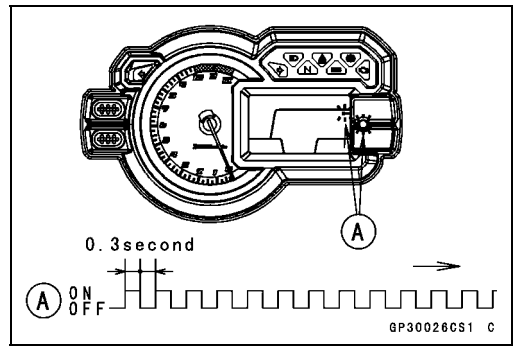


Immobilizer System (Equipped Models)

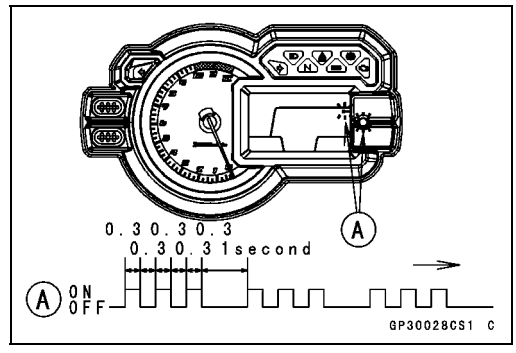
When Registered Ignition Key is Inserted.



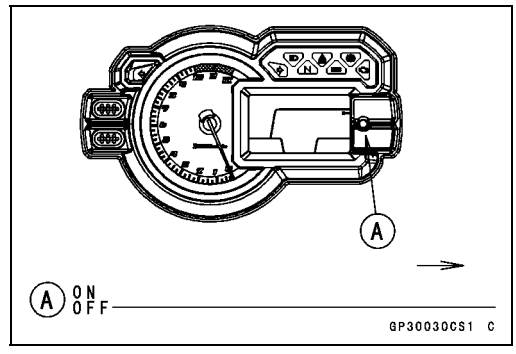
Ignition Key Collation Error



- The ignition key 1 is successfully registered in the ECU.
- ○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 3 times and stop for 1 second and then repeat this cycle.
- ○This procedure has registered the registered ignition key and 2 ignition keys.
- Turn to OFF the ignition switch and wait for period of more than 15 seconds.
- The registration mode automatically ends.



- The red warning indicator light (LED) [A] goes off.



NOTE

- ○*Turn the ignition switch to ON with the registered ignition key.*
- ○*Check that the engine can be started using all registered ignition keys.*

Immobilizer System (Equipped Models)

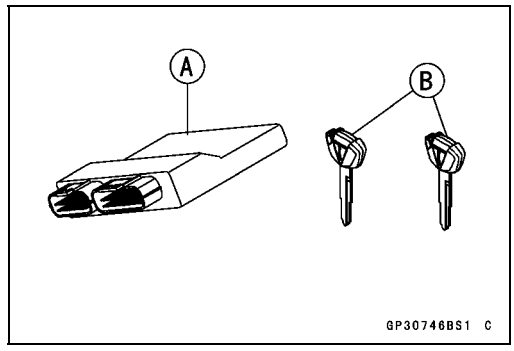
Case 4: When all registered ignition keys are faulty or lost.

The all registered ignition keys replacement is considered very rare case. However if it is required, the following is necessary.

NOTE

○*The ECU must be replaced with a new one because the registered ignition key code that is registered in the current ECU can not be rewritten.*

● Prepare a new ECU [A] and 2 new ignition keys [B].



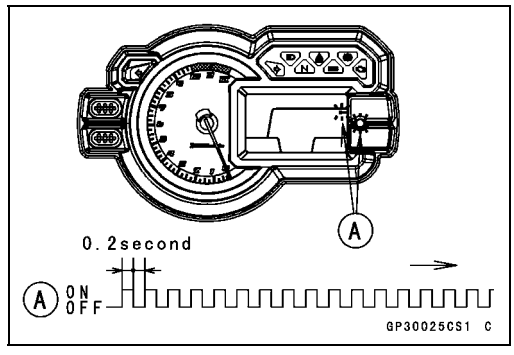
NOTE

○*The key registration unit is not required.*
○*The key registration process is same as the case 3.*

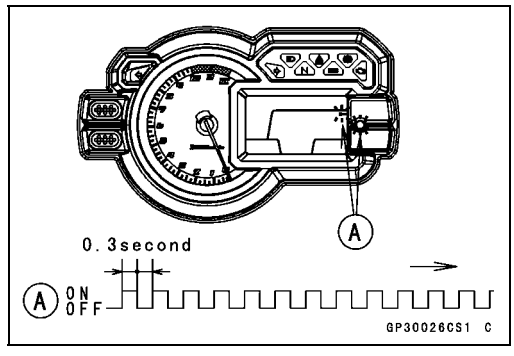
● Insert the first ignition key into the ignition switch and turn it ON.

○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.

Immobilizer Amplifier Failure

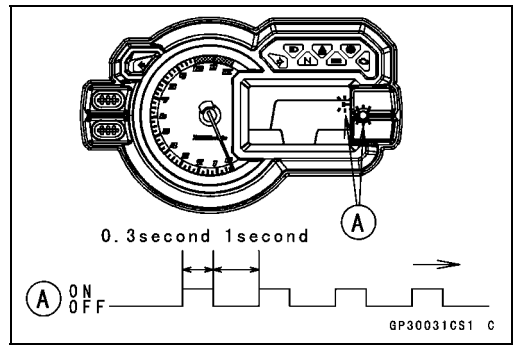


Ignition Key Collation Error

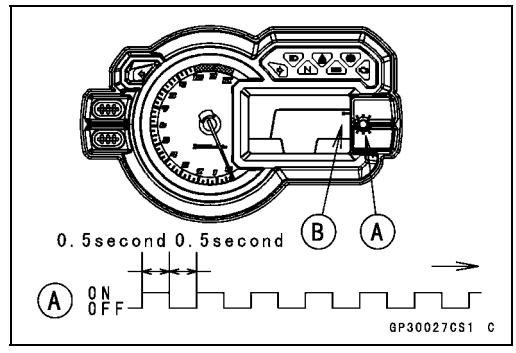


Immobilizer System (Equipped Models)

● The first ignition key is successfully registered in the ECU.
○The red warning indicator light (LED) and the immobilizer warning symbol [A] blink 1 time and stops for 1 second and the repeats this cycle to indicate successful registration of the first ignition key.



● Turn to OFF the ignition switch and remove the first ignition key.
○The immobilizer warning symbol [B] disappears.
○The red warning indicator light (LED) [A] then blinks for 15 seconds; it means the ECU is in the registration mode.
○After 15 seconds, the ECU ends the registration mode and stops blinking the red warning indicator light (LED).



NOTE

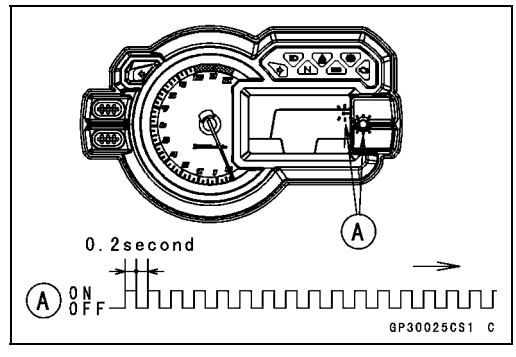
○*Insert and turn on the next key between 15 seconds that the ECU is in the registration mode.*
○*When a registration mode was ended, do the registered ignition key verification procedure over again to restart it. This applies to all ignition key registration.*

● Insert the second ignition key into the ignition switch, and turn it to ON.

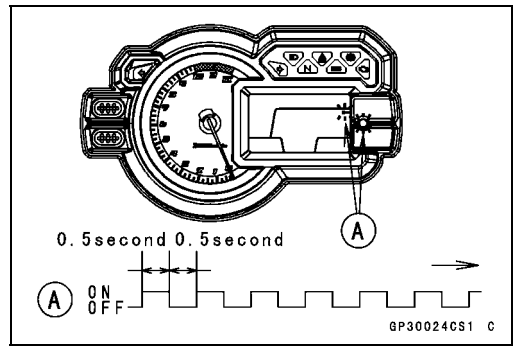
NOTE

○*Keep other ignition keys away from the immobilizer antenna.*

○If there is any problem in the registration, the red warning indicator light (LED) and the immobilizer warning symbol [A] blink to display the collation error.
Immobilizer Amplifier Failure

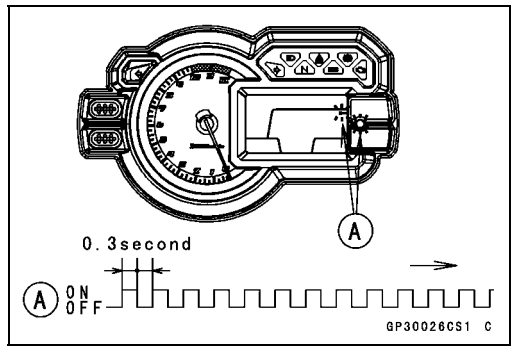


When Registered Ignition Key is Inserted.



Immobilizer System (Equipped Models)

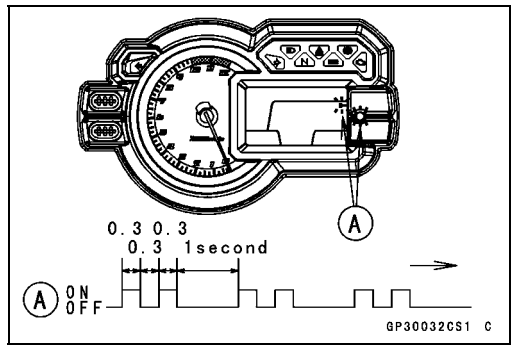
Ignition Key Collation Error



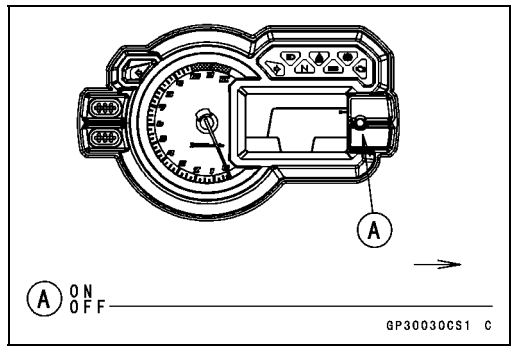
- The second ignition key is registered in the ECU.

○The red warning indicator light (LED) and the immobilizer warning symbol [A] blinks 2 time and stops for 1 second and the repeats this cycle to indicate successful registration of the second ignition key.

- Turn to OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- The red warning indicator light (LED) [A] goes off.



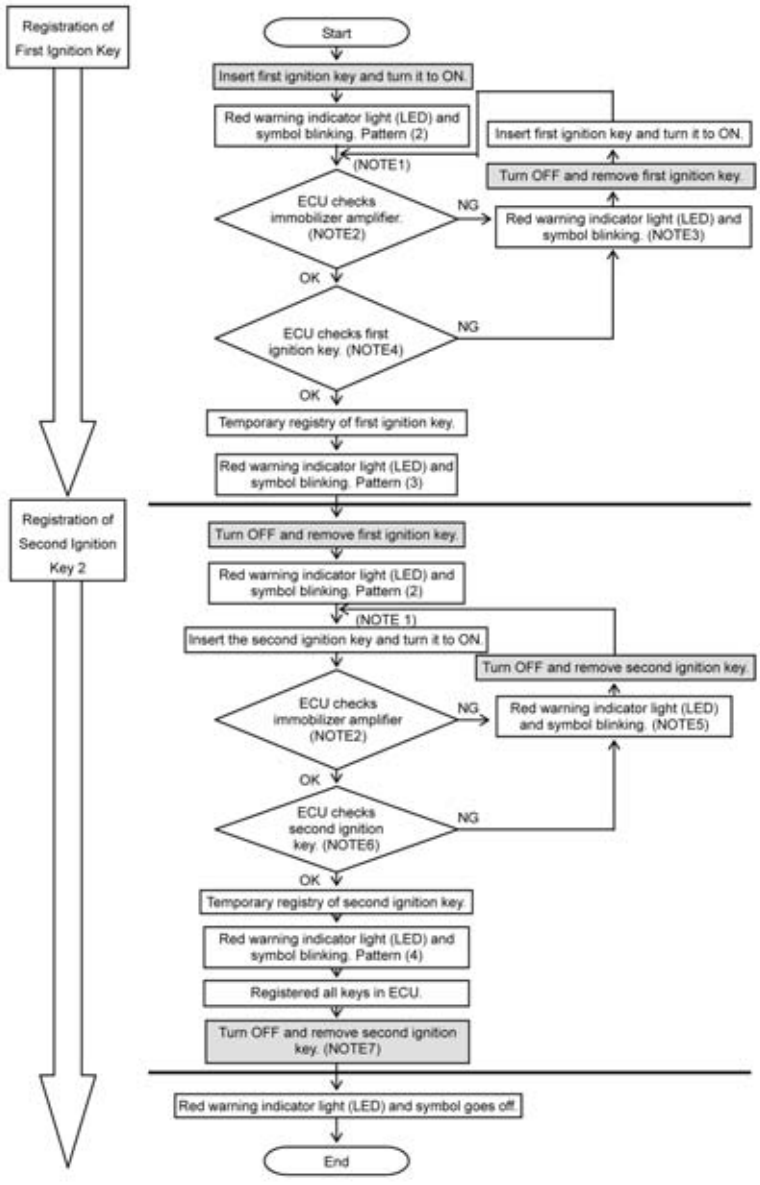
NOTE

○*Turn the ignition switch ON with the registered ignition key.*

○*Check that the engine can be started using all registered ignition keys.*

Immobilizer System (Equipped Models)

All Keys Initial Registration Flow Chart


Registration of First Ignition Key
Start
Insert first ignition key and turn it to ON.
Red warning indicator light (LED) and symbol blinking. Pattern (2)
(NOTE1)
ECU checks immobilizer amplifier. (NOTE2)
NG
Red warning indicator light (LED) and symbol blinking. (NOTE3)
Insert first ignition key and turn it to ON.
Turn OFF and remove first ignition key.
OK
ECU checks first ignition key. (NOTE4)
NG
OK
Temporary registry of first ignition key.
Red warning indicator light (LED) and symbol blinking. Pattern (3)
Registration of Second Ignition Key 2
Turn OFF and remove first ignition key.
Red warning indicator light (LED) and symbol blinking. Pattern (2)
(NOTE 1)
Insert the second ignition key and turn it to ON.
Turn OFF and remove second ignition key.
ECU checks immobilizer amplifier (NOTE2)
NG
Red warning indicator light (LED) and symbol blinking. (NOTE5)
OK
ECU checks second ignition key. (NOTE6)
NG
OK
Temporary registry of second ignition key.
Red warning indicator light (LED) and symbol blinking. Pattern (4)
Registered all keys in ECU.
Turn OFF and remove second ignition key. (NOTE7)
Red warning indicator light (LED) and symbol goes off.
End
Key registry action
Blinking Patterns and Number
0. 2second
(1)
0. 5second 0. 5second
(2)
0. 3second 1second
(3)
0. 3 0. 3
0. 3 1second
(4)
0. 3second
(5)

NOTE

1. Key Substitute Time
   Insert next key and turn ON within 15 seconds after previous key is turned OFF.
2. ECU confirms the following.
   - O Power Supply of Amplifier
   - O Connection of Amplifier
   - O Time of Transmitting and Receiving Messages.
3. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O Ignition Key Collation Error Pattern (5)
4. ECU confirms the following.
   - O Ignition Key or Not
   - O Match the Unique Code
5. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O Second Ignition Key Collation Error Pattern (5)
   - O Registered Ignition Key is Inserted Pattern (2)
6. ECU confirms the following.
   - O Ignition Key or Not.
   - O Match the Unique Code
   - O Not Registered Ignition Key
7. When the ECU-registered key is turned "OFF", ECU keeps the power "ON" for two seconds.
   And then, in two seconds after the key is "OFF", ECU turns the power "OFF".

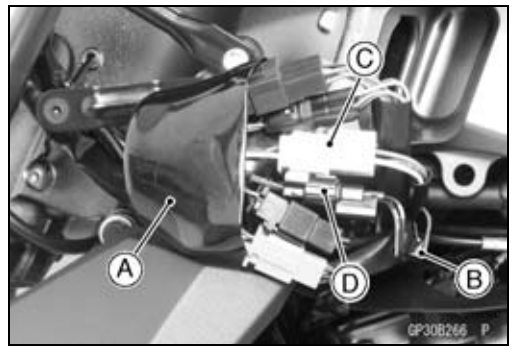
GP30052C F

Immobilizer System (Equipped Models)

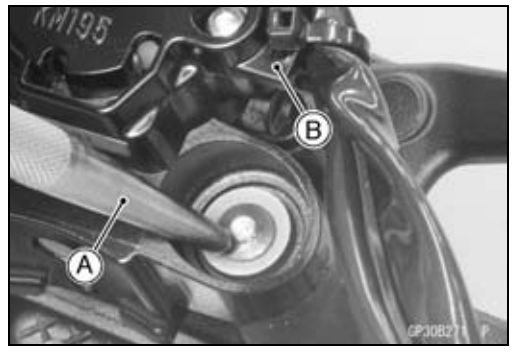
Immobilizer System Parts Replacement

Ignition Switch (Immobilizer Antenna) Replacement

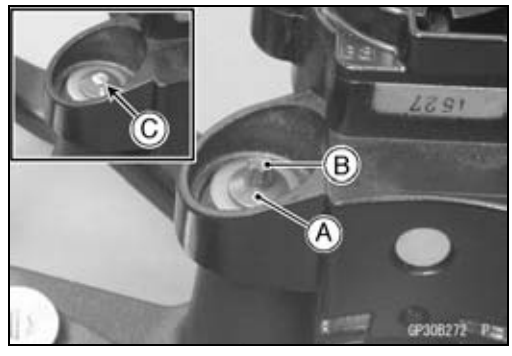
- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Lower Handlebar Holder Assembly (see Handlebar Removal in the Steering chapter)
  Left Side Cover (see Side Cover Removal in the Frame chapter)
- Slide the dust cover [A] and clear the clamp [B].
- Disconnect the ignition switch lead connector [C] and immobilizer antenna lead connector [D].



- Remove the steering stem (see Stem, Stem Bearing Removal in the Steering chapter).
- Using a small chisel or punch [A], turn out the Torx bolts.
- Remove the ignition switch [B].

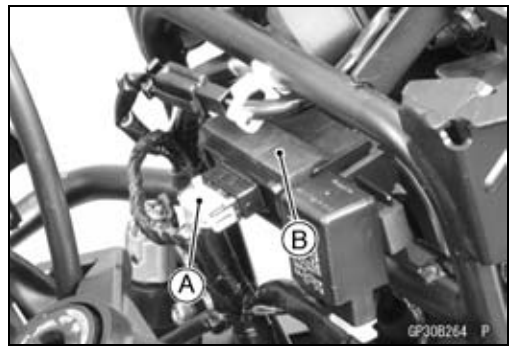


- Tighten a new Torx bolt [A] until the bolt head [B] is broken [C].
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



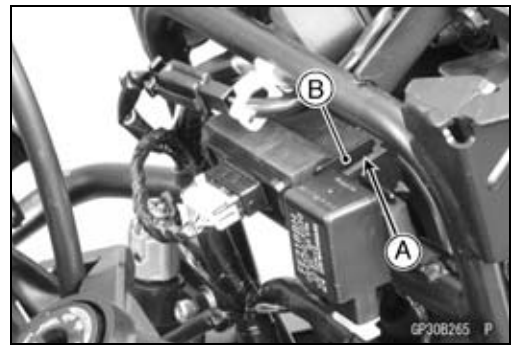
Immobilizer Amplifier Replacement

- Remove:
  Meter Cover (see Meter Cover Removal in the Frame chapter)
  Immobilizer Amplifier connector [A]
  Immobilizer Amplifier [B]



Immobilizer System (Equipped Models)

- Fit the slit [A] on the damper to the bracket projection [B] (Both Sides).

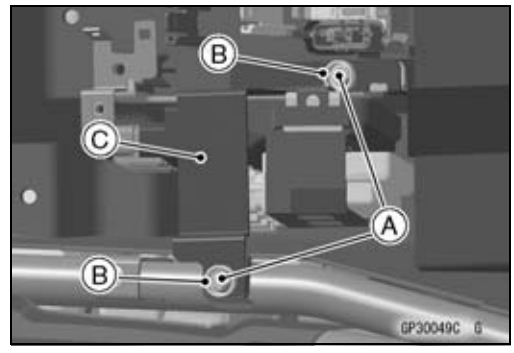


ECU Replacement

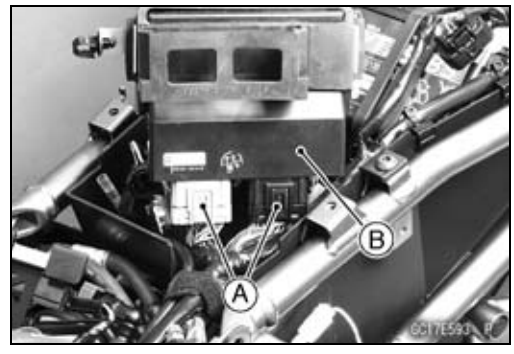
NOTICE

Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.

- Remove:
  Seat (see Seat Removal in the Frame chapter)
- For WVTA (78.2 H) and GB WVTA (FULL H) Models, using a small chisel or other suitable tool, remove the screws [A], washers [B] and ECU guard [C].



- Remove:
  Relay Box (see Relay Box Removal)
  ECU Connectors [A]
  ECU [B]

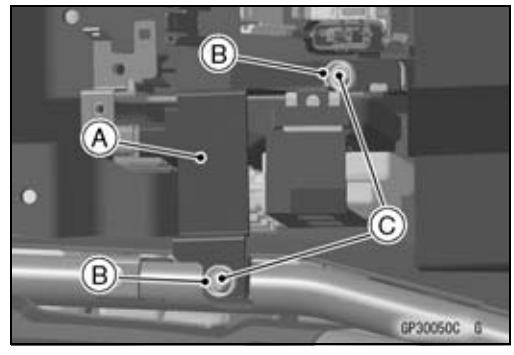


- Connect the connectors to the ECU.
- For WVTA (78.2 H) and GB WVTA (FULL H) Models, install the ECU guard [A] and washers [B].

NOTICE

Do not pinch the leads.

- For WVTA (78.2 H) and GB WVTA (FULL H) Models, tighten the new screws [C] using the Kawasaki genuine screws of which threads are coated with locking agent.



Immobilizer System (Equipped Models)

Immobilizer Relational Parts Replacement Chart

		Failed or Lost Part			
		Ignition Key (Black)	Ignition Switch	Amplifier	ECU
*	Ignition Key (Black)	●	○		
	Ignition Switch		●		
	Amplifier			●	
	ECU	○			●

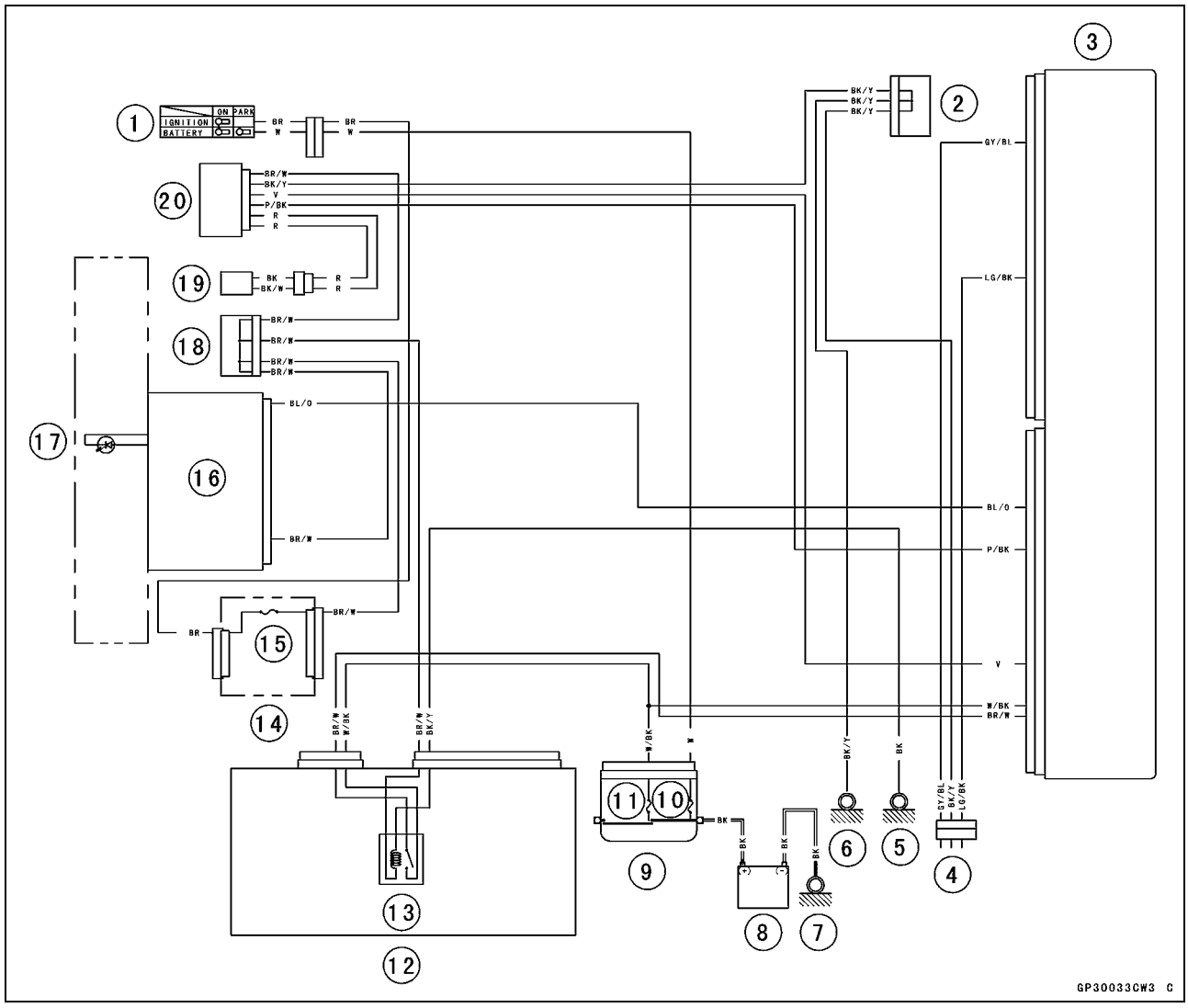
*	Replacement Part
●	Main Replacement Part
○	Additional Replacement Part

Immobilizer System Inspection

- Refer to the Immobilizer Amplifier and Blank Key Detection section in the Fuel System (DFI) chapter.

Immobilizer System (Equipped Models)

Immobilizer System Circuit



1. Ignition Switch
2. Joint Connector E
3. ECU
4. Immobilizer/Kawasaki Diagnostic System Connector
5. Frame Ground 3
6. Frame Ground 1
7. Engine Ground
8. Battery 12 V 8 Ah
9. Starter Relay
10. Main Fuse 30 A
11. ECU Fuse 15 A
12. Relay Box
13. ECU Main Relay
14. Fuse Box 1
15. Ignition Fuse 15 A
16. Meter Unit
17. Red Warning Indicator Light (LED)
    (Battery/Oil Pressure/Water Temperature/Immobilizer)
18. Joint Connector F
19. Immobilizer Antenna
20. Immobilizer Amplifier

Switches and Sensors

Brake Light Timing Inspection

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

Brake Light Timing Adjustment

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).

○For the switch housings and the ignition switch, refer to the tables in the Wiring Diagram.

★If the switch has an open or short, repair it or replace it with a new one.

Special Tool - Hand Tester: 57001-1394

Rear Brake Light Switch Connections

Rear Brake Light Switch Connections		
Color	BR	BL
When brake pedal is pushed down	○———	———○
When brake pedal is released		

Sidestand Switch Connections

Sidestand Switch Connections		
Color	BK	G
When sidestand is down		
When sidestand is up	○———	———○

Neutral Switch Connections

Neutral Switch Connections		
Color	SW. Terminal	Ground
When transmission is in neutral	○———	———○
When transmission is not in neutral		

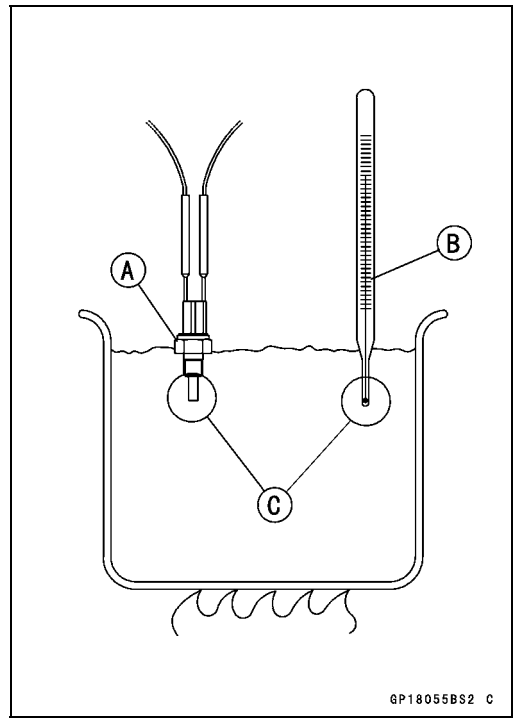
Oil Pressure Switch Connections*

Oil Pressure Switch Connections *		
Color	SW. Terminal	Ground
When engine is stopped	○———	———○
When engine is running		

*: Engine lubrication system is in good condition.

Switches and Sensors

Water Temperature Sensor Inspection



- Remove the water temperature sensor (see Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter).
- Suspend the sensor [A] in a container of coolant so that the temperature-sensing projection [C] is submerged.
- Suspend an accurate thermometer [B] with temperature -sensing projection located in almost the same depth with the sensor.

NOTE

○*The sensor and thermometer must not touch the container side or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.

★If the hand tester does not show the specified values, replace the sensor.

Water Temperature Sensor Resistance

Temperature	Resistance (kΩ)
–20°C (–4°F)	*18.80 ±2.37
0°C (32°F)	*(about 6.544)
40°C (104°F)	1.136 ±0.095
100°C (212°F)	0.1553 ±0.0070

*: Reference Information

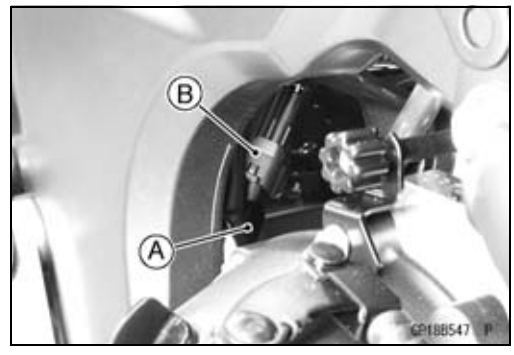
Oxygen Sensor Removal

NOTICE

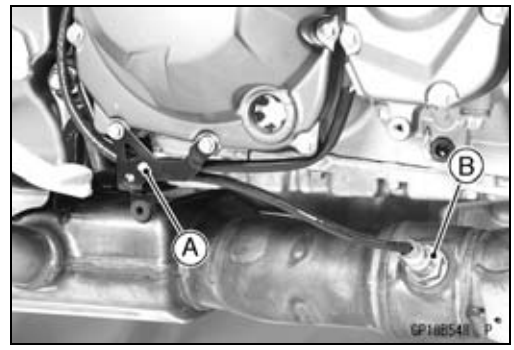
Never drop the sensor especially on a hard surface. Such a shock to the sensor can damage it.

NOTICE

Do not pull strongly, twist, or bend the oxygen sensor lead. This may cause the wiring open.



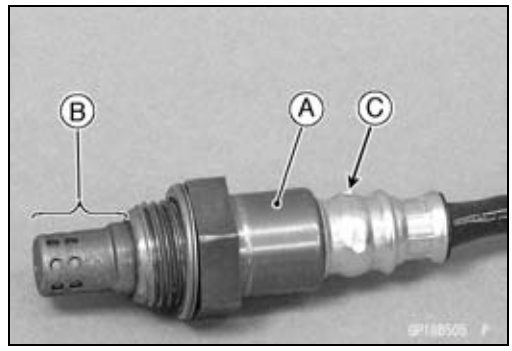
- Clear the oxygen sensor lead from the clamp [A].
- Disconnect the oxygen sensor lead connector [B].



- Remove the right lower fairing (see Lower Fairing Removal in the Frame chapter).
- Clear the oxygen sensor lead from the clamp [A].
- Remove the oxygen sensor [B].

Switches and Sensors

Oxygen Sensor Installation



NOTICE

Never drop the oxygen sensor [A] especially on a hard surface. Such a shock to the unit can damage it. Do not touch the sensing part [B] and filter holes [C] of the sensor to prevent oil contact. Oil contamination from hands can reduce sensor performance.

- Tighten:

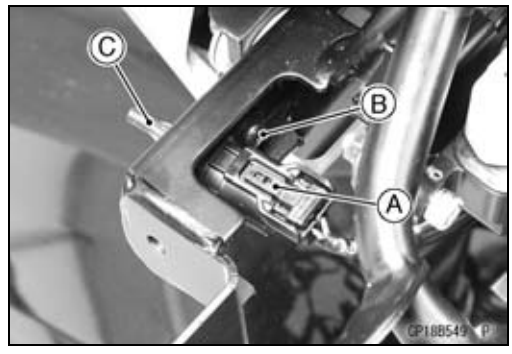
  Torque - Oxygen Sensor: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Run the oxygen sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Oxygen Sensor Inspection

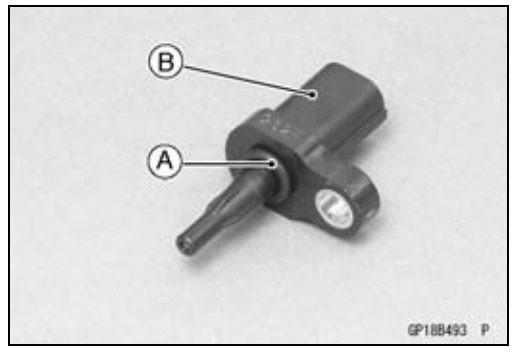
- Refer to the Oxygen Sensor Inspection in the Fuel System (DFI) chapter.

Outside Temperature Sensor Removal



- Remove:
  Left Upper Side Fairing (see Upper Side Fairing Removal in the Frame chapter)
  Connector [A] (Disconnect)
  Screw [B]
  Outside Temperature Sensor [C]

Outside Temperature Sensor Installation



- Check that the O-ring [A] is in place on the outside temperature sensor [B].
- Tighten the screw securely.
- Install:
  Left Upper Side Fairing (see Upper Side Fairing Installation in the Frame chapter)

Switches and Sensors

Outside Temperature Sensor Inspection

- Remove the outside temperature sensor (see Outside Temperature Sensor Removal).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion is submerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with the sensor.

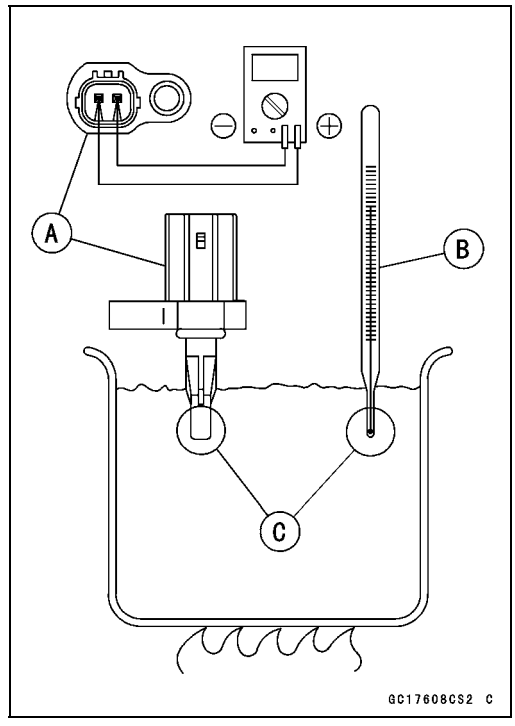
NOTE

○*The sensor and thermometer must not touch the container side or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the following.

Outside Temperature Sensor Resistance
Standard: 5.4 ~ 6.6 kΩ at 0°C (32°F)
0.29 ~ 0.39 kΩ at 80°C (176°F)

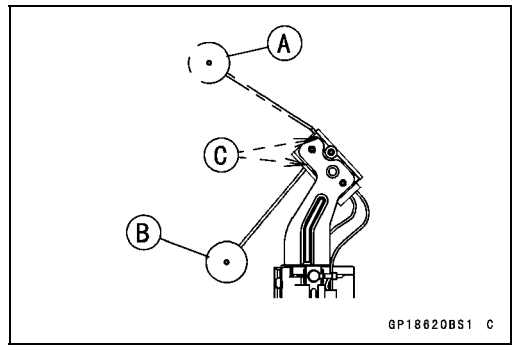
★If the reading is out of the standard, replace the sensor.



Fuel Level Sensor Inspection

- Remove:
  Fuel Pump (see Fuel Pump Removal in the Fuel System (DFI) chapter)
- Check that the float moves up and down smoothly without binding. It should go down under its own weight.

★If the float does not move smoothly, replace the fuel pump.
Float in Full Position [A]
Float in Empty Position [B]
Float Arm Stoppers [C]

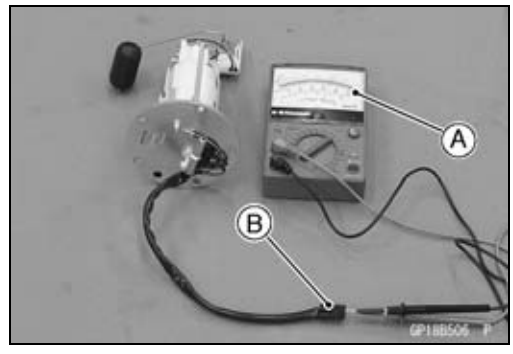


- Using the hand tester [A], measure the resistance across the terminals in the fuel level sensor lead connector [B].

Special Tools - Hand Tester: 57001-1394
Needle Adapter set: 57001-1457

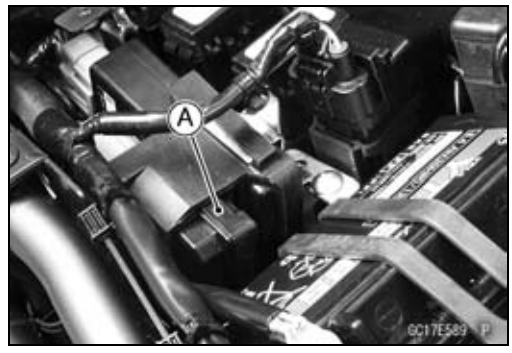
★If the tester readings are not as specified, or do not change smoothly according as the float moves up and down, replace the fuel pump.

Fuel Level Sensor Resistance
Standard: Full position: 9.6 ~ 12.4 Ω
Empty position: 222 ~ 228 Ω



Relay Box

The relay box [A] has relays and diodes. The relays and diodes can not be removed.

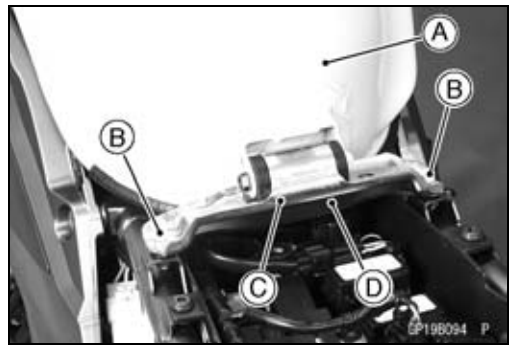


Relay Box Removal

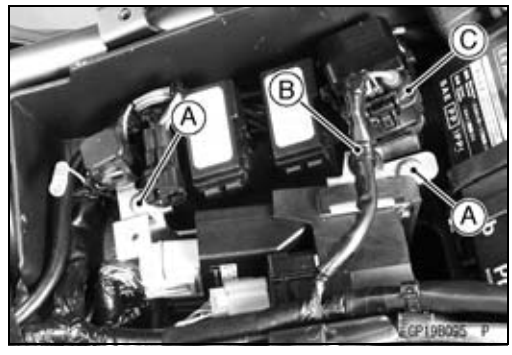
NOTICE

Never drop the relay box especially on a hard surface.
Such a shock to the relay box can damage it.

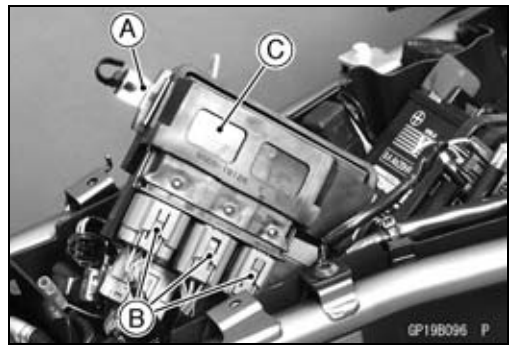
- Remove:
  Fuel Tank [A] (see Fuel Tank Removal in the Fuel System (DFI) Chapter)
  Bolts [B]
  Bracket [C]
  Cross Member [D]



- For WVTA (78.2 H) and GB WVTA (FULL H) Models, remove the ECU guard (see Immobilizer System Parts Replacement).
- Remove:
  Screws [A]
  Band [B]
  Connector [C]



- Pull up the bracket assembly [A].
- Disconnect the connectors [B] and remove the relay box [C].



Relay Box Installation

- Installation is the reverse of removal.

Relay Box

Relay Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the relay box as shown (see Relay Box Internal Circuit in this section).

★If the tester does not read as specified, replace the relay box.

Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading (Ω)
Headlight Circuit Relay	1-3	∞
ECU Main Relay	7-6	∞
	4-5	Not ∞*
Fuel Pump Relay	7-8	∞
	9-10	Not ∞*
Starter Circuit Relay	11-16	∞
	11-12	∞
Radiator Fan Relay	17-20	∞
	18-19	Not ∞*

*: The actual reading varies with the hand tester used.

Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (–)	Tester Connection	Tester Reading (Ω)
ECU Main Relay	2-11	1-3	0
	4-5	7-6	0
Fuel Pump Relay	9-10	7-8	0
Radiator Fan Relay	18-19	17-20	0

	Battery Connection (+) (–)	Tester Connection DC 25 V Range (+) (–)	Tester Reading (V)
Starter Circuit Relay	16-12	11-12	Battery Voltage

(+): Apply positive lead.
(–): Apply negative lead.

Relay Box

Diode Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit in this section).

Diode Circuit Inspection

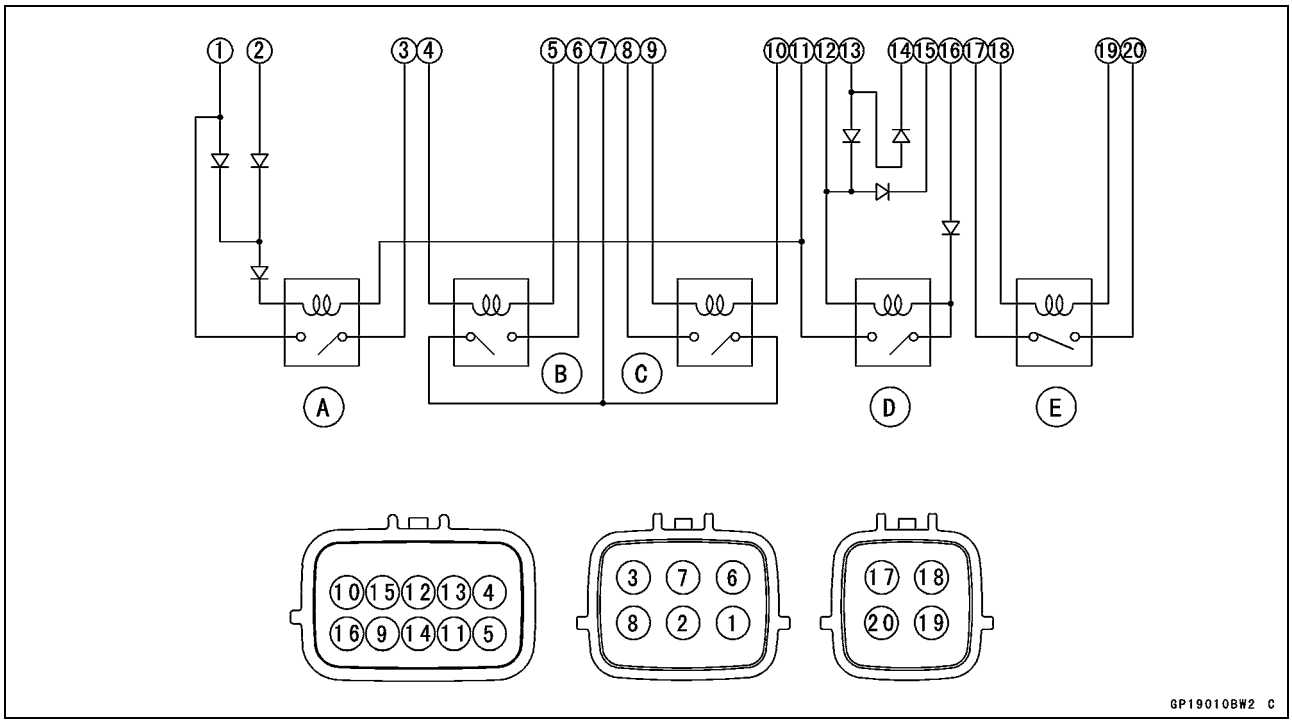
Tester Connection	1-11, 2-11, 12-13, 12-15, 12-16, 13-14, 13-15

★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

NOTE

○*The actual meter reading varies with the meter or tester used and the individual diodes, but generally speaking, the lower reading should be from zero to one half the scale.*

Relay Box Internal Circuit

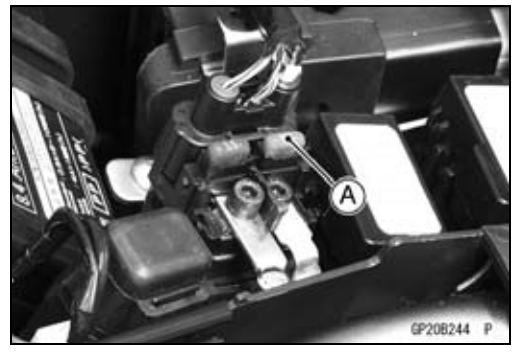


A: Headlight Circuit Relay
B: ECU Main Relay
C: Fuel Pump Relay
D: Starter Circuit Relay
E: Radiator Fan Relay

Fuse

30 A Main Fuse Removal

- Remove:
  Starter Cable Terminal Cover (see Starter Relay Inspection)
- Pull out the main fuse [A] from the starter relay with a needle nose pliers.

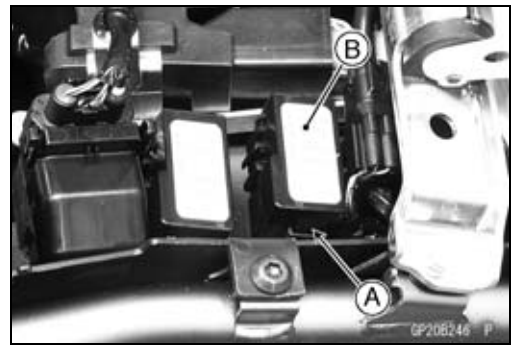


15 A ECU Fuse Removal

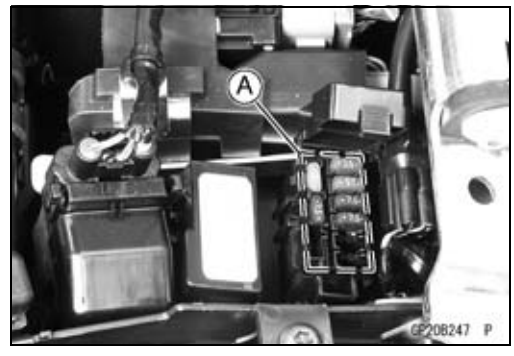
- Remove:
  Starter Cable Terminal Cover (see Starter Relay Inspection)
- Pull out the fuse [A].

Fuse Box Fuse Removal

- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Unlock the hooks [A] to lift up the lids [B].



- Pull the fuses [A] straight out of the fuse box with needle nose pliers.

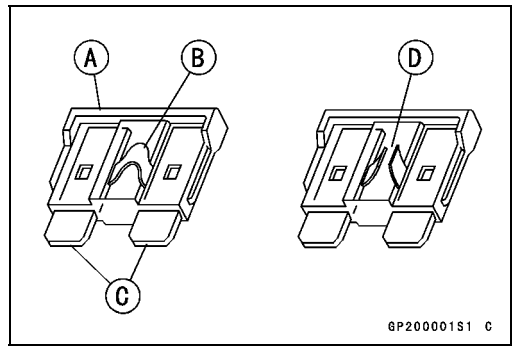


Fuse Installation

- If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.
- Install the fuse box fuses on the original position as specified on the lid.

Fuse

Fuse Inspection



- Remove the fuse.
- Inspect the fuse element.

★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

Housing [A]
Fuse Element [B]
Terminals [C]
Blown Element [D]

NOTICE

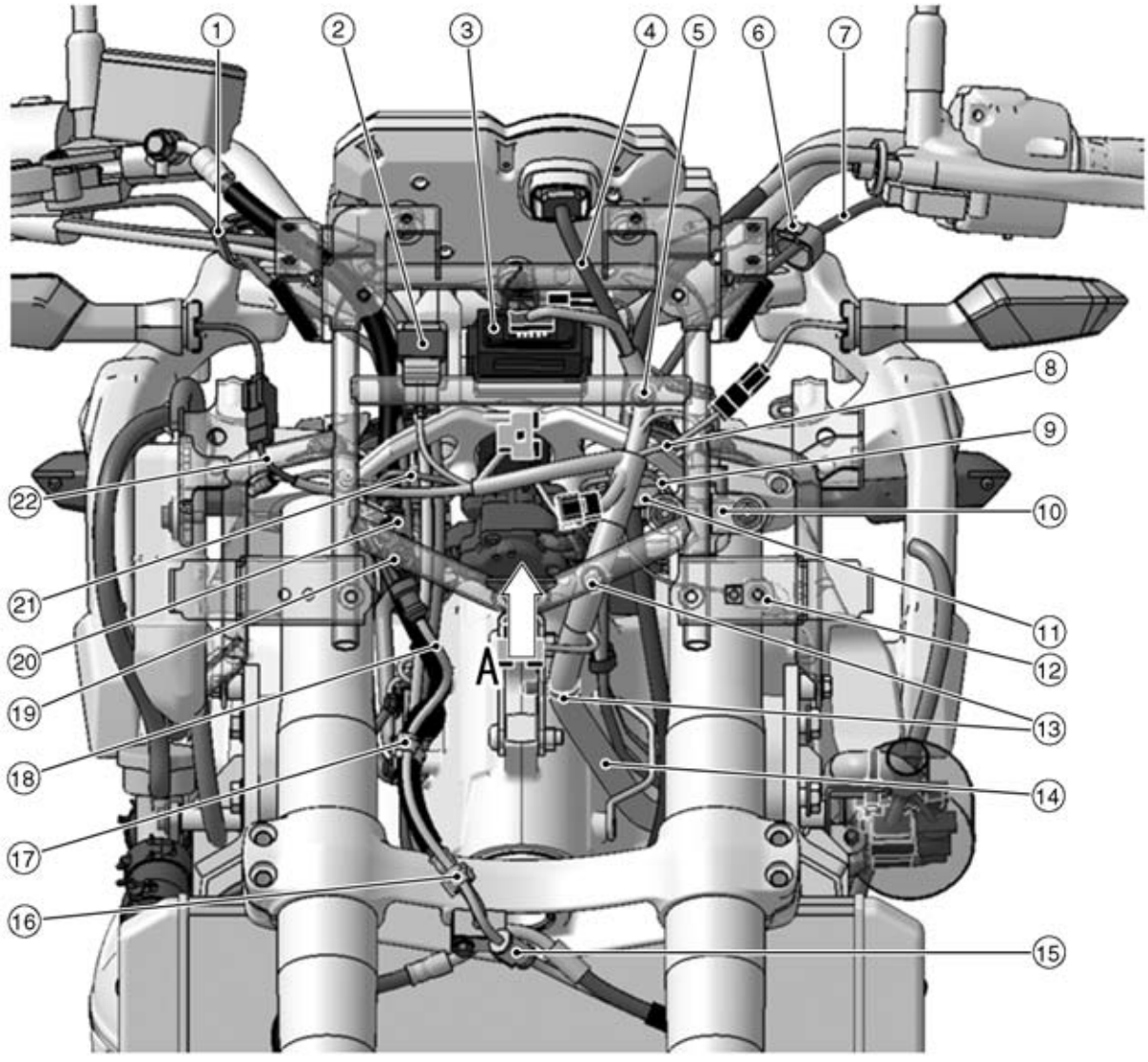
When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.

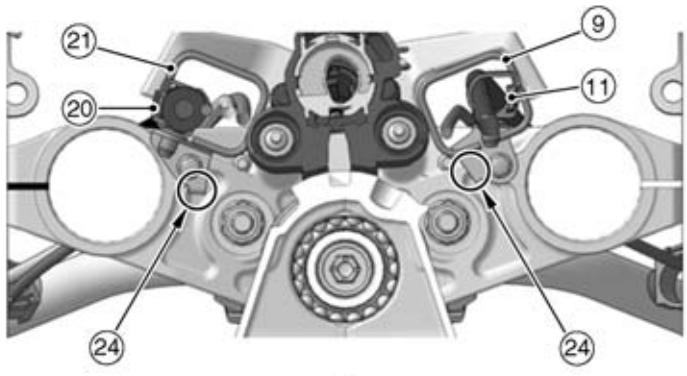
Appendix

Table of Contents

Cable, Wire, and Hose Routing 17-2
Troubleshooting Guide 17-48

Cable, Wire, and Hose Routing





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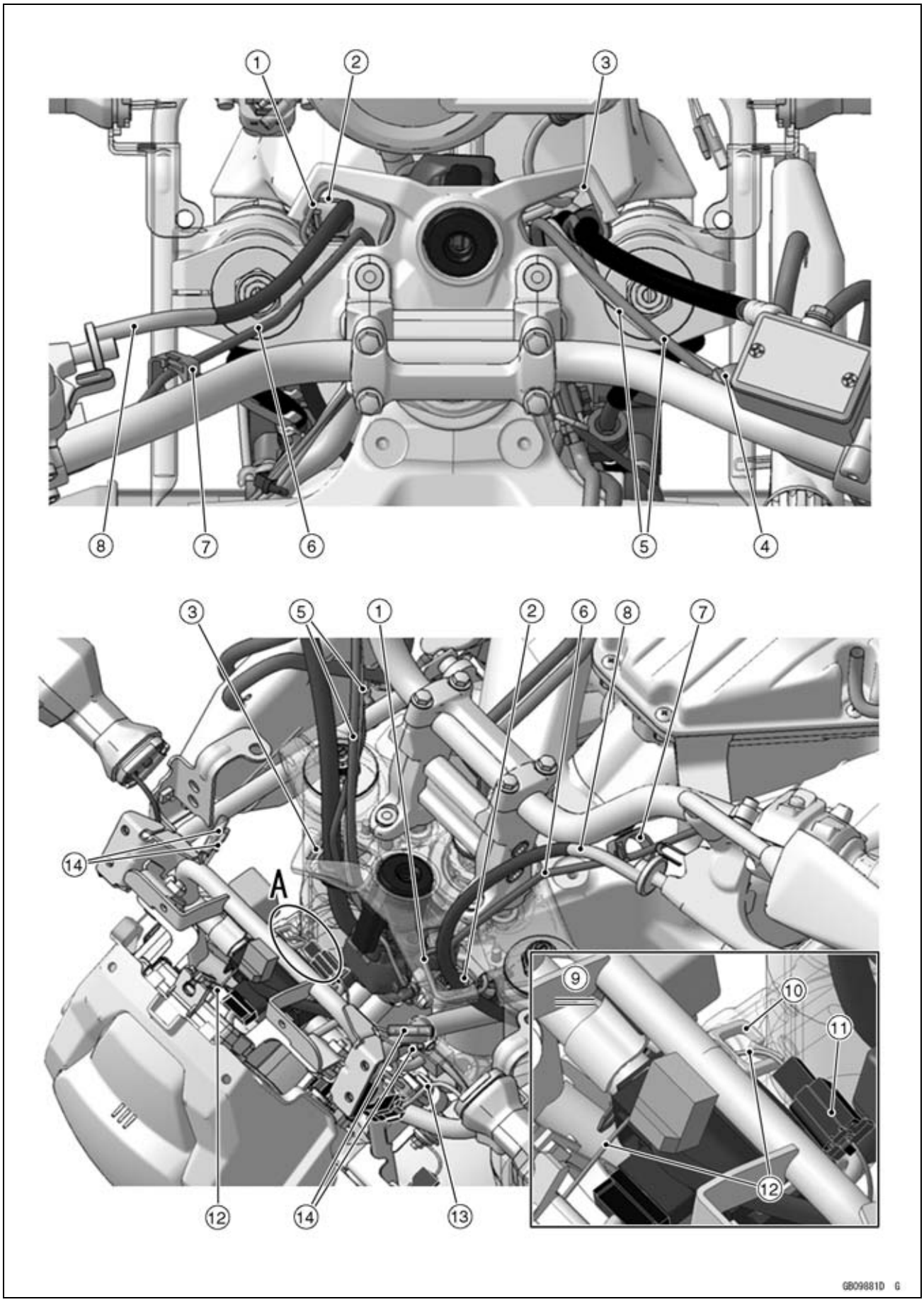
Cable, Wire, and Hose Routing

1. Hold the right switch housing lead and throttle cables to the handlebars with the clamp*.
2. Turn Signal Relay
3. Immobilizer Amplifier (equipped models)
4. Run the meter unit lead to front of the meter bracket.
5. Hold the main harness to the meter bracket.
6. Hold the left turn signal light lead to the handlebars with the clamp*.
7. Left Switch Housing Lead
8. Run the left turn signal light lead to front of the meter bracket.
9. Run the left switch housing lead and clutch cable into the guide.
10. Vehicle-down Sensor
11. Run the clutch cable into the clamp*.
12. Outside Temperature Sensor
13. Hold the main harness to the meter bracket.
14. Main Harness
15. Clamp
16. Hold the front wheel rotation sensor lead to the brake hose fitting with the clip at the white mark on the lead. Install the clip so that the lead is placed at front of the hose, and face its open side in direction as shown.
17. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at front of the hose, and face its open side in direction as shown.
18. Front Wheel Rotation Sensor Lead
19. Hold the front wheel rotation sensor lead to the meter bracket.
20. Hold the brake hose with the clamp* at the rubber protector.
21. Run the brake hose, right switch housing lead and throttle cables into the guide.
22. Run the right turn signal light lead to front of meter bracket.
23. Viewed from A (behind the steering stem head)
24. Position the guides with its tabs into the grooves on the steering stem head.

*: Before clamping, face the locking portion of the clamp in direction as shown.

Cable, Wire, and Hose Routing

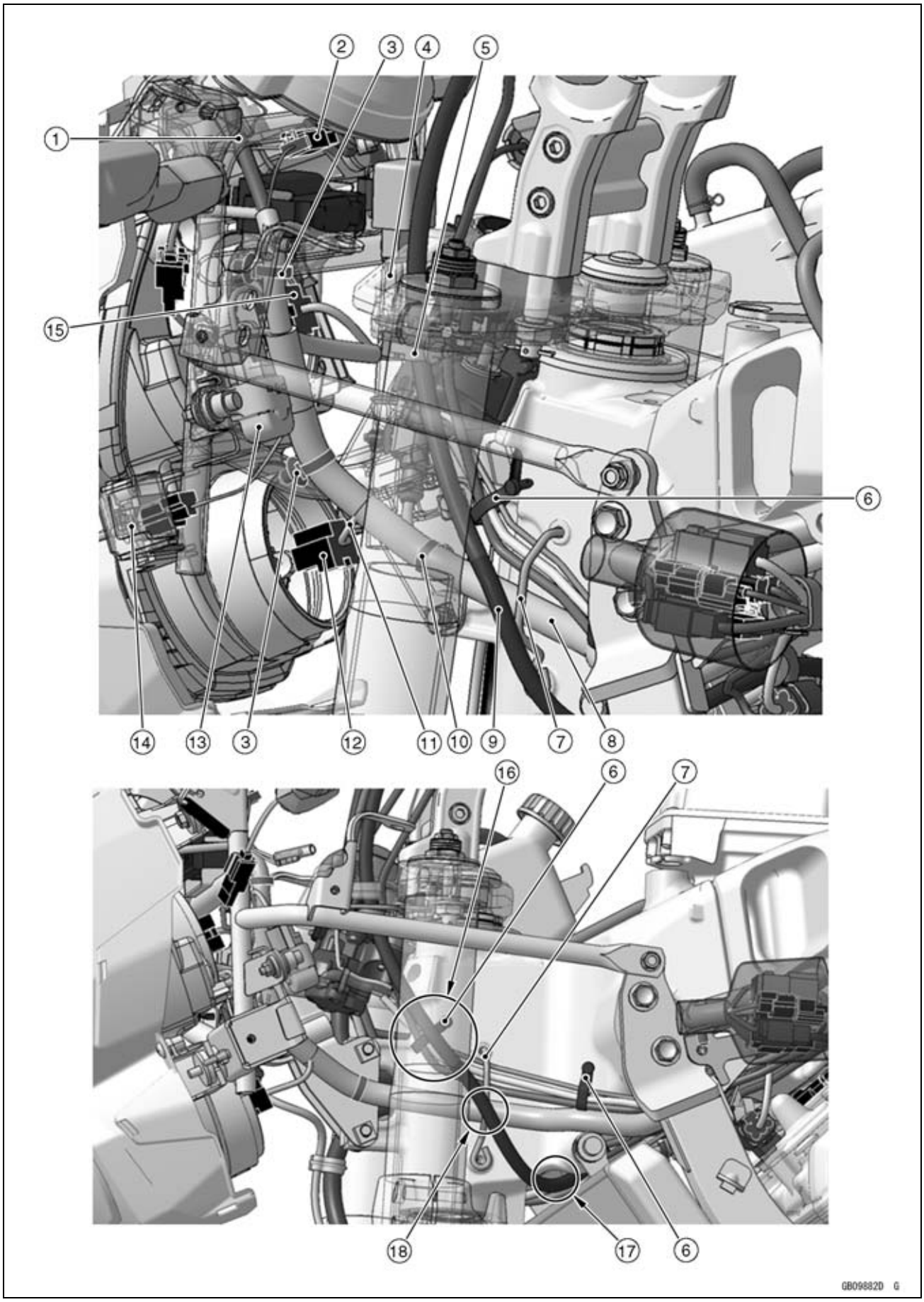


Cable, Wire, and Hose Routing

1. Run the clutch cable and left switch housing lead into the guide.
2. Hold the clutch cable with the clamp*.
3. Run the brake hose, right switch housing lead and throttle cables into the guide.
4. Hold the right switch housing lead and throttle cables to the handlebars with the clamp*.
5. Throttle Cables
6. Left Switch Housing Lead
7. Hold the left switch housing lead to the handlebars with the clamp*.
8. Clutch Cable
9. Detail A
10. Clamp
11. City Light Lead Connector
12. Run the city light lead to under the meter bracket.
13. Left Turn Signal Lead
14. Accessory Lead Connectors

*: Before clamping, face the locking portion of the clamp in direction as shown.

Cable, Wire, and Hose Routing

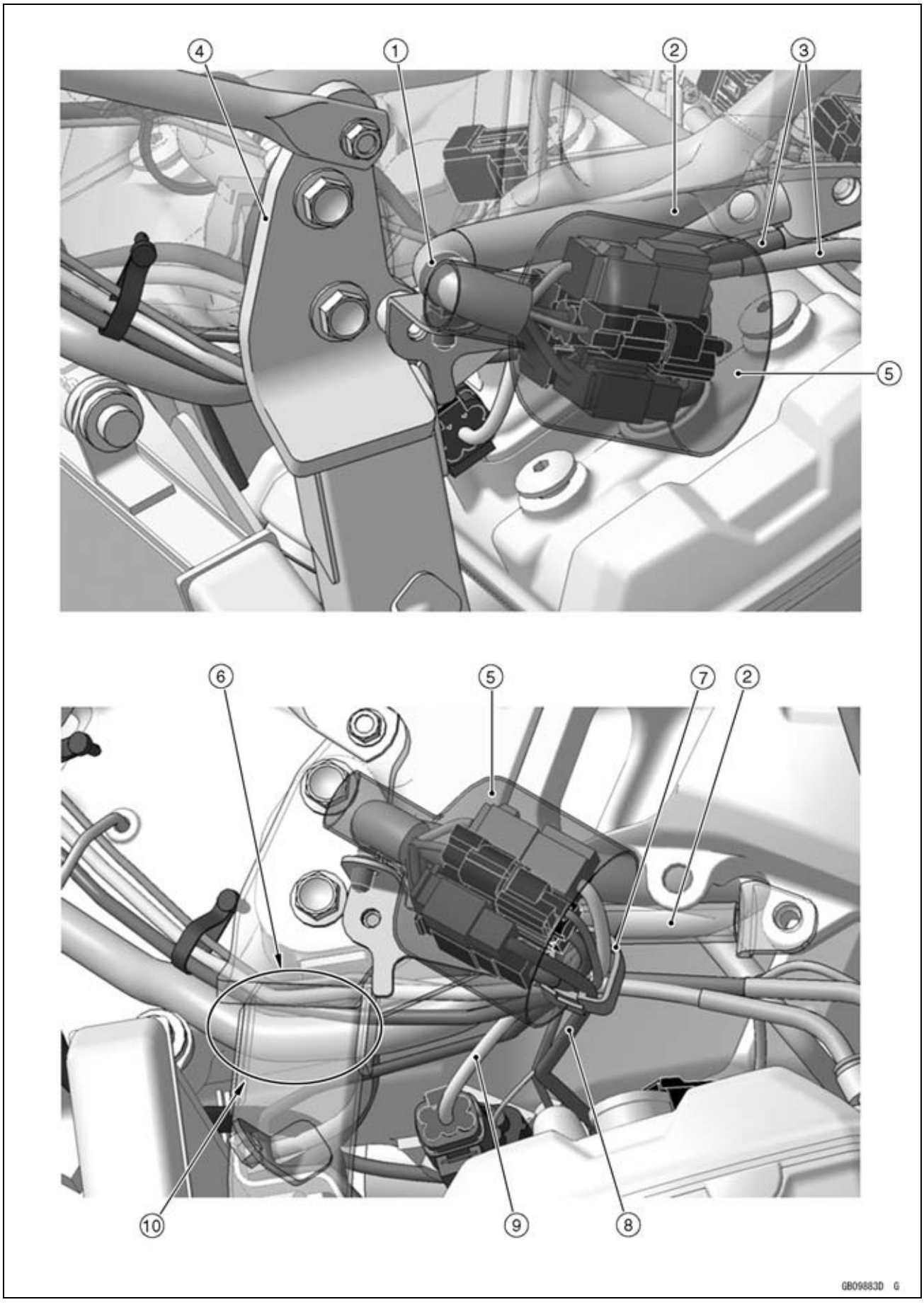


Cable, Wire, and Hose Routing

1. Run the meter unit lead to front of the meter bracket.
2. Hold the city light lead to the meter bracket with the clamp.
3. Hold the main harness to the meter bracket.
4. Run the clutch cable and left switch housing lead into the guide.
5. Hold the clutch cable with the clamp*.
6. Tie the ignition switch lead, immobilizer antenna lead (equipped models) and left switch housing lead with clamp.
7. Run the main harness, ignition switch lead, immobilizer antenna lead (equipped models) and left switch housing lead into the guide.
8. Main Harness
9. Clutch Cable
10. Hold the main harness to the meter bracket.
11. Run the high beam headlight lead through the outside of frame to avoid contact with the meter bracket.
12. High Beam Headlight Lead Connector
13. Vehicle-down Sensor
14. Intake Air Temperature Sensor
15. Low Beam Headlight Lead Connector
16. Run the main harness, ignition switch lead, immobilizer antenna lead (equipped models), left switch housing lead and clutch cable through inside of the left fork tube.
17. Run the clutch cable between the radiator upper brackets.
18. Run the clutch cable to the outside of the leads and clamp.

*: Before clamping, face the locking portion of the clamp in direction as shown.

Cable, Wire, and Hose Routing

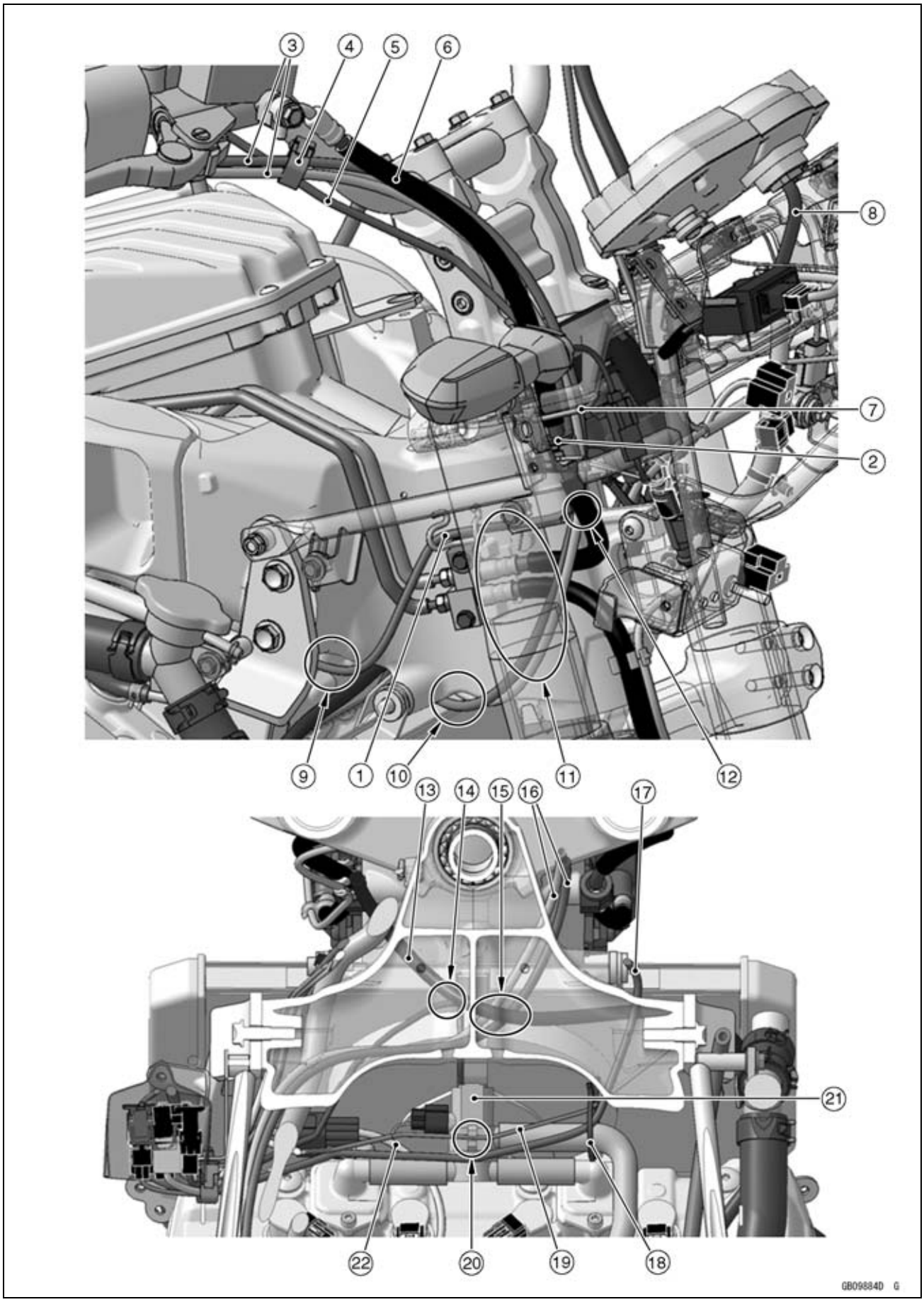


Cable, Wire, and Hose Routing

1. Hold the main harness to the left engine bracket.
2. Run the main harness to the upside of the left engine bracket.
3. Run the throttle cables to under the main harness.
4. Left Engine Bracket
5. Slide the dust cover over the connectors.
6. Run the right switch housing lead, ignition switch lead, radiator fan motor lead, immobilizer antenna lead (equipped models) and left switch housing lead to under the throttle cables.
7. Hold the right switch housing lead, ignition switch lead, radiator fan motor lead, immobilizer antenna lead (equipped models) and left switch housing lead to the left engine bracket with the clamp*.
8. Right Switch Housing Lead
9. Main Harness (to Engine Subharness)
10. Run the right switch housing lead, ignition switch lead, radiator fan motor lead, immobilizer antenna lead (equipped models) and left switch housing lead to the inside of the left engine bracket.

*: Before clamping, face the locking portion of the clamp in direction as shown.

Cable, Wire, and Hose Routing

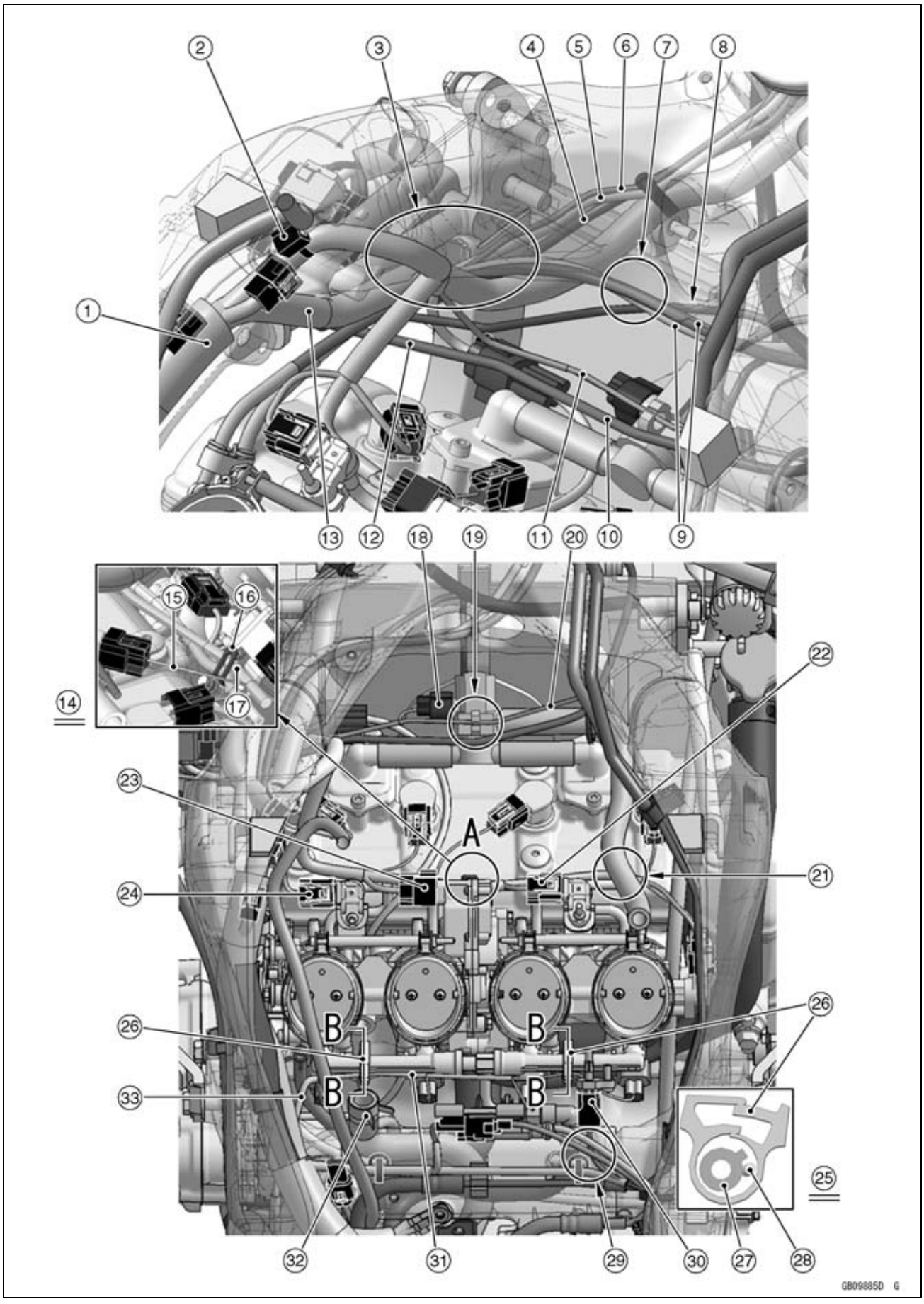


Cable, Wire, and Hose Routing

1. Hold the right switch housing lead to the frame with the clamp.
2. Hold the brake hose with the clamp* at the rubber protector.
3. Throttle Cables
4. Hold the right switch housing lead and throttle cables to the handlebars with the clamp*.
5. Right Switch Housing Lead
6. Brake Hose
7. Run the brake hose, right switch housing lead and throttle cables into the guide.
8. Run the meter unit lead to front of the meter bracket.
9. Run the right switch housing lead through this point to the inside of the frame.
10. Run the throttle cables through this point to the inside of the frame.
11. Run the throttle cables and right switch housing lead through inside of the right fork tube.
12. Run the throttle cables and right switch housing lead to the inside of the brake hose.
13. Clutch Cable
14. Run the clutch cable to the upside of the radiator fan motor lead.
15. Run the clutch cable to the upside of the throttle cables.
16. Throttle Cables
17. Right Switch Housing Lead
18. Hold the right switch housing lead and horn lead with the clamp.
19. Horn Lead
20. Hold the horn lead with the clamp on the air switching valve.
21. Air Switching Valve
22. Engine Subharness

*: Before clamping, face the locking portion of the clamp in direction as shown.

Cable, Wire, and Hose Routing

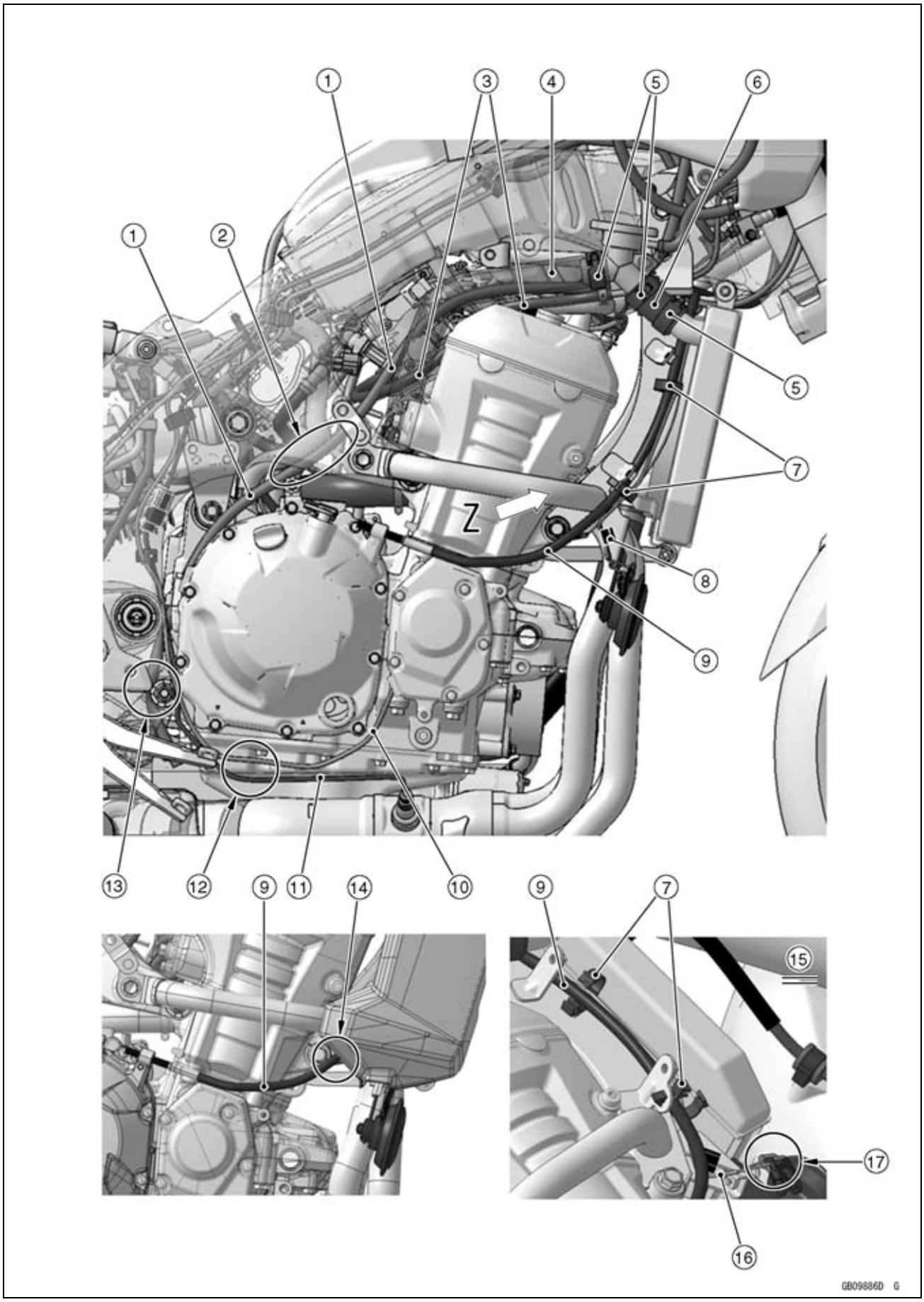


Cable, Wire, and Hose Routing

1. Main Harness
2. Insert the clip on the main harness to the rib on the frame to hold the main harness.
3. Run the left switch housing lead, ignition switch lead and immobilizer antenna lead (equipped models) through from outside of the main harness to under the left engine bracket and throttle cables, then run them to outside of the frame.
4. Left Switch Housing Lead
5. Ignition Switch Lead
6. Immobilizer Antenna Lead (Equipped Models)
7. Run the radiator fan motor lead to front of the air switching valve lead, to under the left engine bracket and throttle cables, and to upside of the engine subharness, then run it to outside of the frame.
8. Run the radiator fan motor lead to front of the throttle cables.
9. Throttle Cables
10. Right Switch Housing Lead
11. Horn Lead
12. Run the right switch housing lead to the rear of the air switching valve lead, to under the left engine bracket and throttle cables, to upside of the engine subharness, then run it to outside of the frame.
13. Run the main harness between the left engine bracket and the frame, then run it to outside of the frame.
14. Detail A
15. Stick Coil Lead for #3 Cylinder
16. Hold the throttle sensor lead and throttle body tube with the clamp at white mark on the tube.
17. White Mark
18. Air Switching Valve Lead Connector
19. Hold the horn lead with the clamp on the air switching valve.
20. Horn Lead
21. Run the air switching valve hose to the upside of the throttle sensor lead.
22. Intake Air Pressure Sensor #2 Lead Connector
23. Subthrottle Valve Actuator Lead Connector
24. Intake Air Pressure Sensor #1 Lead Connector
25. Section B-B
26. Hold the injector lead with the clamps.
27. Fuel Pipe
28. Run the injector lead to under the projection on the fuel pipe as shown.
29. Run the intake air temperature sensor lead to under the crankshaft sensor lead.
30. Intake Air Temperature Sensor
31. Run the injector lead to front of the engine breather hose.
32. Hose Clamp*
33. Injector Lead

*: Face the tabs of the hose clamp in direction as shown.

Cable, Wire, and Hose Routing

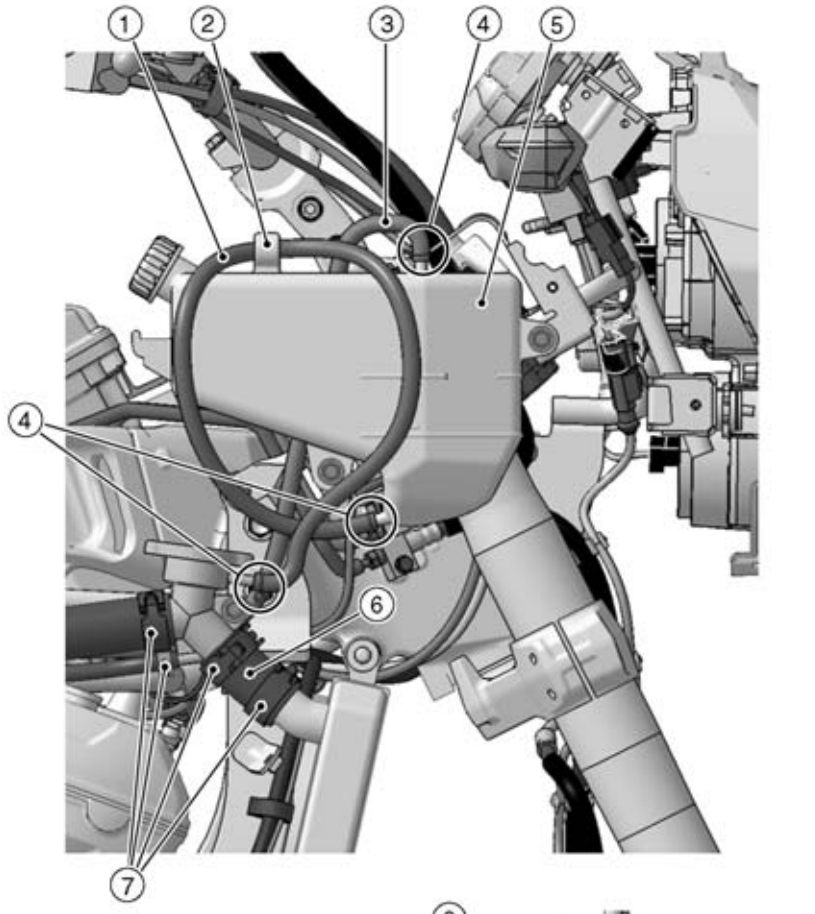


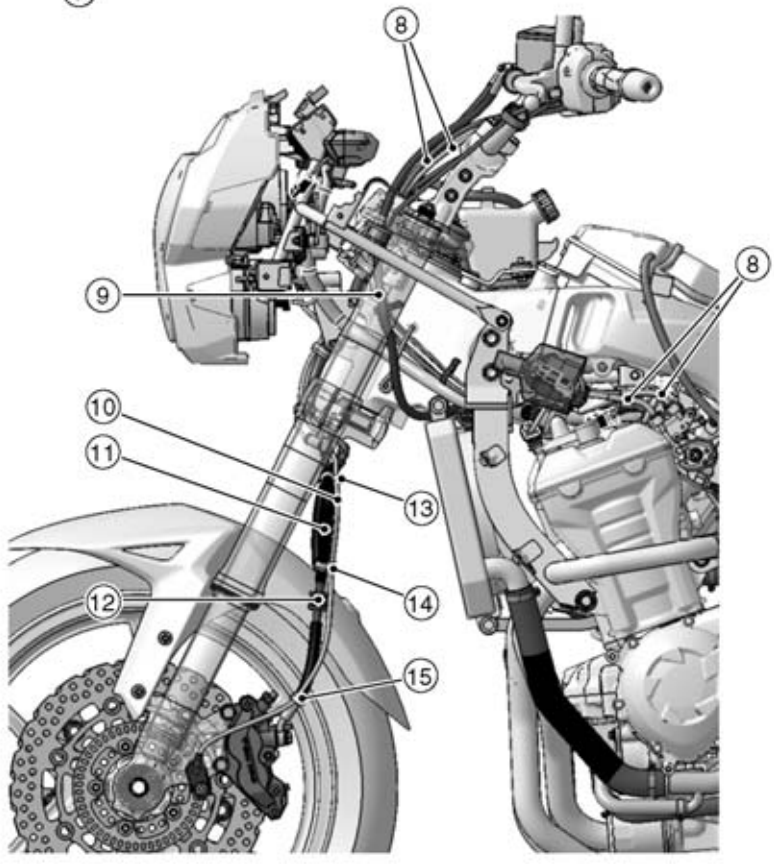
Cable, Wire, and Hose Routing

1. Reserve Tank Overflow Hose
2. Run the reserve tank overflow hose to inside of the frame.
3. Water Hose (Cylinder Head to Radiator Filler Neck)
4. Water Hose (Thermostat Housing to Radiator Filler Neck)
5. Hose Clamps**
6. Radiator Hose
7. Hold the clutch cable and horn read with the clamps*.
8. Insert the clamp on the lead to the hole on the engine bracket.
9. Clutch Cable
10. Crankshaft Sensor Lead
11. Oxygen Sensor Lead
12. Hold the crankshaft sensor lead and oxygen sensor lead with clamp.
13. Run the reserve tank overflow hose to behind of the adjusting bolt, and between the adjusting bolt and frame, and directs it to under the frame.
14. Run the clutch cable at this point.
15. View Z
16. Horn Lead
17. Connect the horn lead connectors so that its lead comes from inside. Tip the outer horn terminal slightly toward rear to avoid the lead from contact with another connector.

*: Before clamping, face the locking portion of the clamp in direction as shown.
**: Face the tabs of the hose clamp in direction as shown.

Cable, Wire, and Hose Routing





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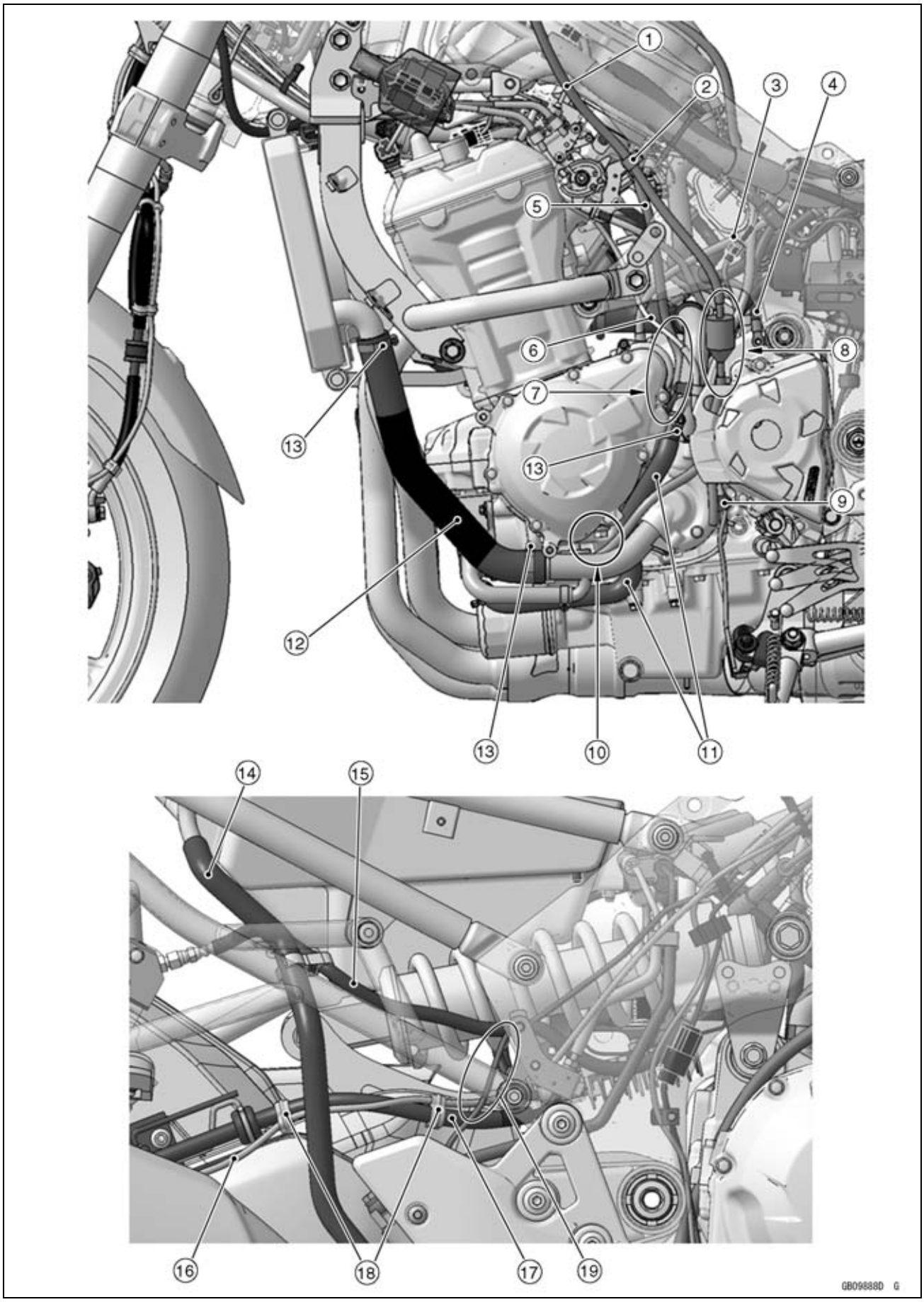
Cable, Wire, and Hose Routing

1. Reserve Tank Return Hose
2. Clip the return hose to the reserve tank.
3. Reserve Tank Overflow Hose
4. Hose Clamps**
5. Reserve Tank
6. Radiator Hose
7. Water Hose Clamps**
8. Throttle Cables
9. Clutch Cable
10. Front Wheel Rotation Sensor Lead
11. Brake Hose
12. Hold the brake hose at the rubber protector to the front fender with the clamp*.
13. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at rear of the hose, and face its open side in direction as shown.
14. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead placed approx. 10 mm (0.4 mm) above the clamp. Install the clip so that the lead is placed at rear of the hose, and face its open side in direction as shown.
15. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at outside of the hose, and face its open side in direction as shown.

*: Before clamping, face the locking portion of the clamp in direction as shown.
**: Face the tabs of the hose clamp in direction as shown.

Cable, Wire, and Hose Routing

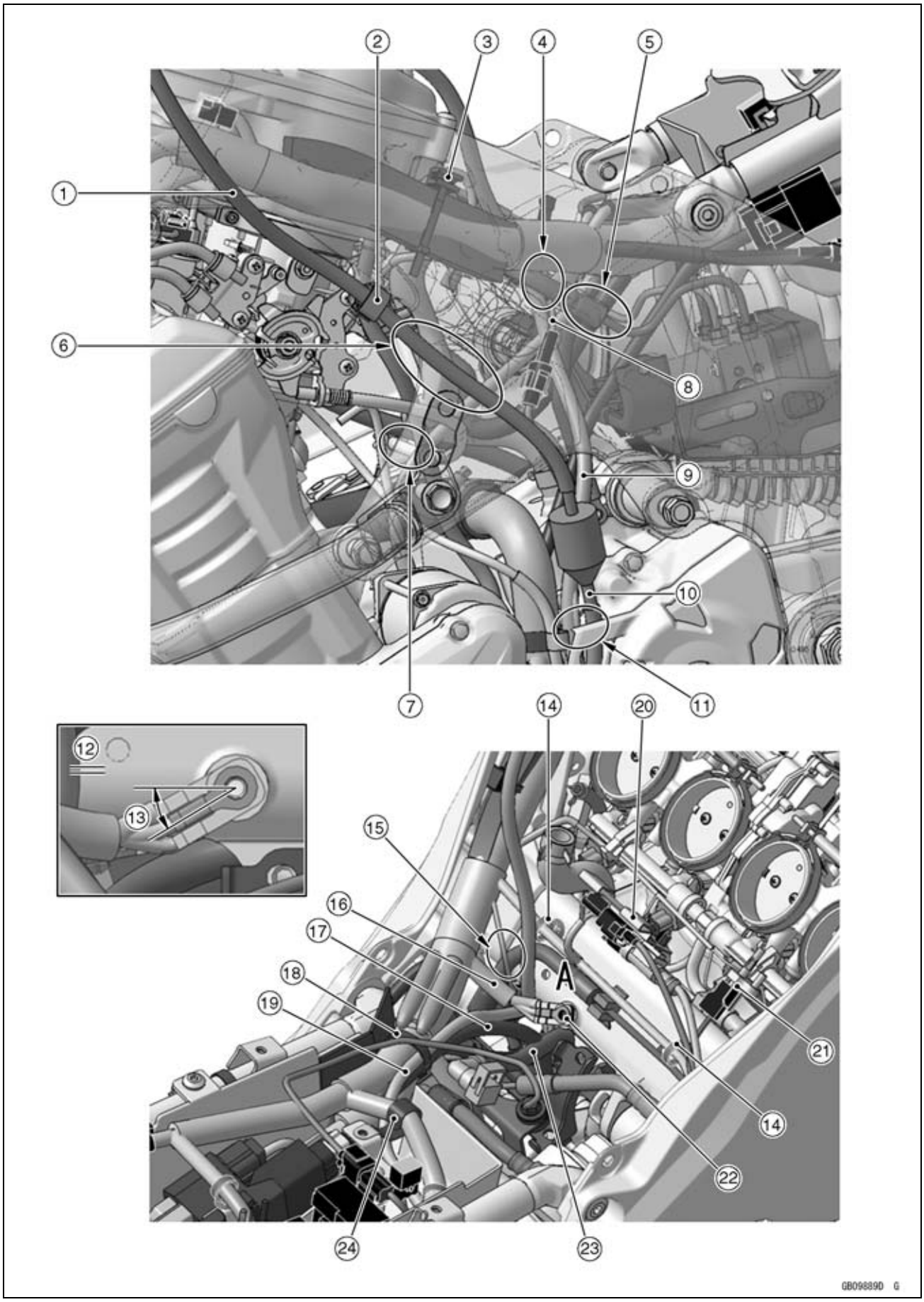


Cable, Wire, and Hose Routing

1. Fuel Tank Breather Hose
2. Clamp*
3. Starter Motor Cable
4. Battery Ground Cable
5. Air Cleaner Drain Hose
6. Engine Subharness
7. Run the alternator lead to the outside of air cleaner drain hose and sidestand switch lead, and to inside of the engine subharness, water pipe, fuel tank drain hose and fuel tank breather hose.
8. Run the sidestand switch lead to inside of the fuel tank breather hose, fuel tank drain hose and alternator lead.
9. Hold the sidestand switch lead with the clamp on the water pump cover.
10. Run the end of fuel tank drain hose as shown.
11. Water Hoses
12. Radiator Hose
13. Hose Clamp**
14. Rear Brake Reservoir Hose
15. Rear Shock Absorber Adjuster Hose
16. Rear Wheel Rotation Sensor Lead
17. Rear Brake Hose
18. Hold the rear wheel rotation sensor lead to the brake hose.
19. Run the rear brake light switch lead to outside of the rear brake hose and rear wheel rotation sensor lead, and inside of the rear frame pipe.

*: Before clamping, face the locking portion of the clamp in direction as shown.
**: Face the tabs of the hose clamp in direction as shown.

Cable, Wire, and Hose Routing

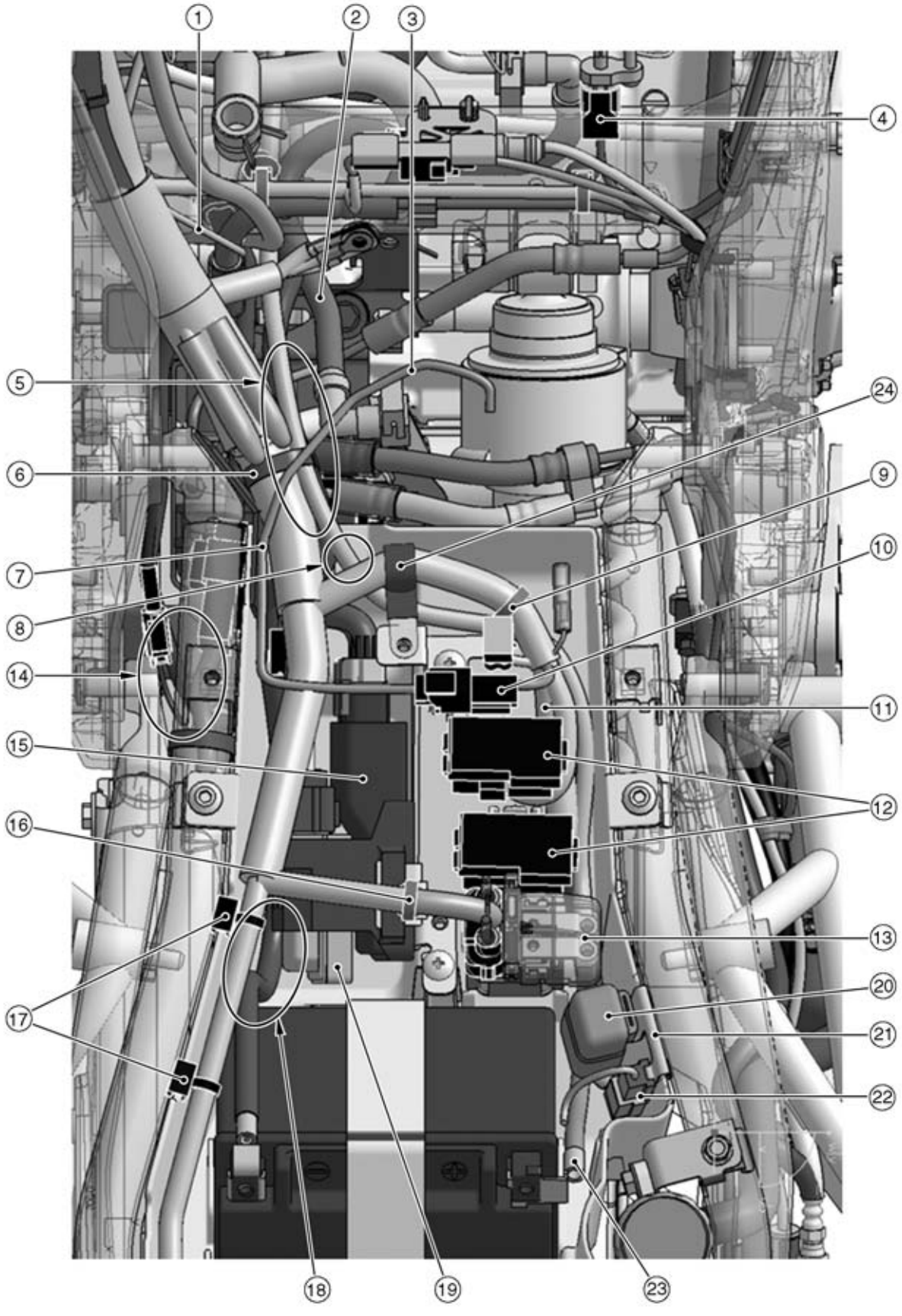


Cable, Wire, and Hose Routing

1. Fuel Tank Breather Hose
2. Clamp*
3. Hold the clamp on the main harness to the rib of the frame as shown.
4. Run the sidestand switch lead to inside of the brake pipe.
5. Run the fuel hose, battery ground cable, fuel tank drain hose, starter motor cable and brake pipe in order from the inside of the frame.
6. Run the fuel tank breather hose to outside of the frame.
7. Run the idle adjusting cable to under the starter motor cable.
8. Run the sidestand switch lead to outside of the starter motor cable.
9. Fuel Tank Drain Hose
10. Fuel Tank Breather Hose
11. Run the fuel tank breather hose, fuel tank drain hose and sidestand switch lead to inside of the drive chain cover.
12. Detail A
13. 20 ~ 30°
14. Hold the harness to the frame with clamps.
15. Run the sidestand switch lead to inside of the brake hose.
16. Run the frame ground cable to the upside of the alternator lead, battery ground cable and brake hose.
17. Run the battery ground cable between the fuel hose and brake hose.
18. Hold the battery ground cable and starter motor cable to the main harness with the band at the front of the branching point on the main harness. After tying them, cut the band excess length and face its knot downward.
19. Run the starter motor cable to outside of the fuel hose, to upside of the alternator lead, brake pipes and battery ground cable, to under the frame ground cable.
20. Hold the rear wheel rotation sensor lead connector and crankshaft sensor lead connector to the air cleaner housing with the holder.
21. Intake Air Temperature Sensor
22. Frame Ground Terminal
23. Fuel Hose
24. Hold the main harness with the clamp so that it positions away from the bracket (KLZ1000AC early model only).

*: Before clamping, face the locking portion of the clamp in direction as shown.

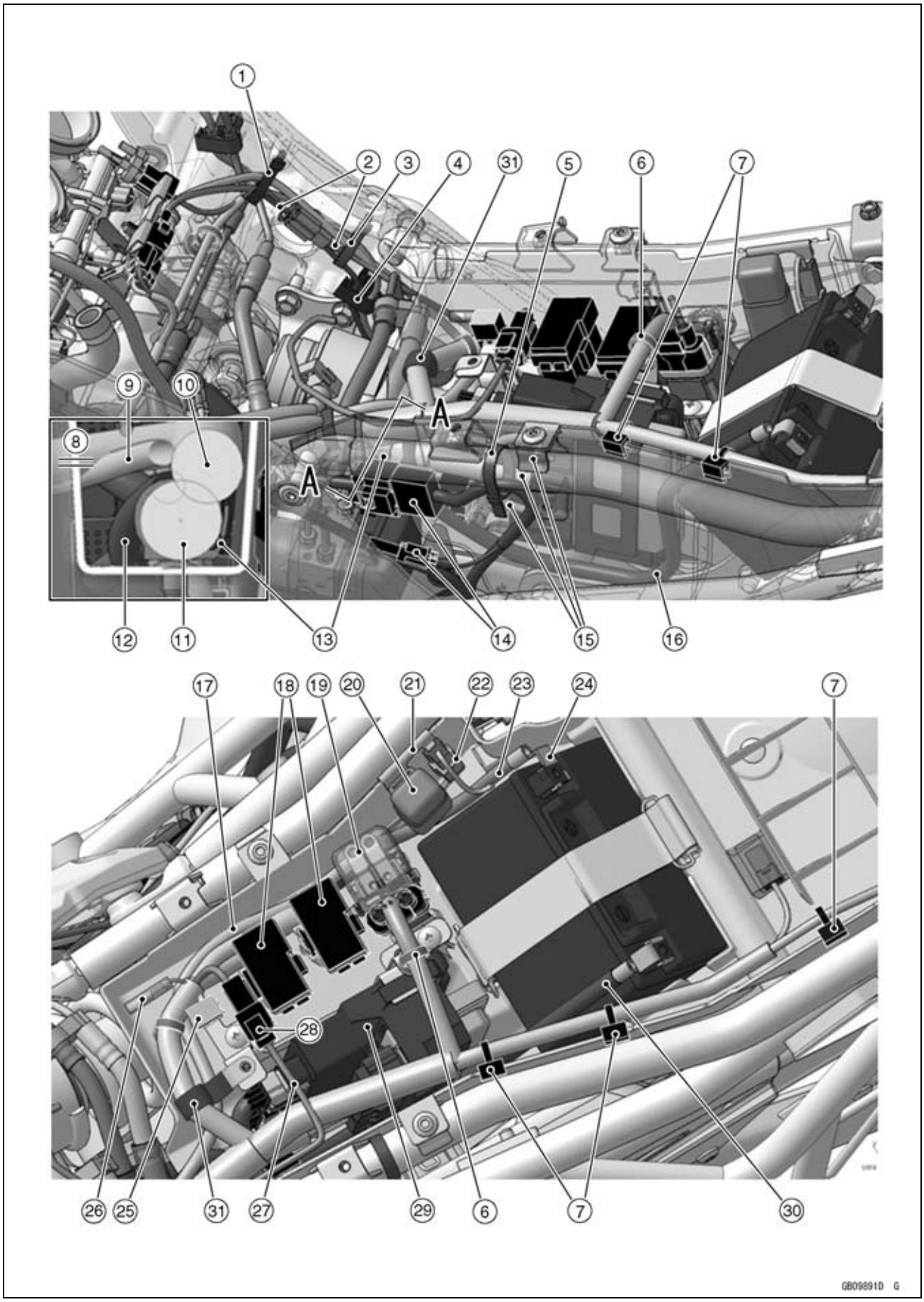
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Sidestand Switch Lead
2. Fuel Hose
3. Fuel Pump Lead
4. Intake Air Temperature Sensor Lead Connector
5. Run the battery ground cable to under the starter motor cable, to outside of the fuel tube, and to upside of the alternator lead and brake pipes.
6. Hold the battery ground cable and starter motor cable to the main harness with the band at the front of the branching point on the main harness. After tying them, cut the band excess length and face its knot downward.
7. Run the fuel pump lead to inside of the main harness.
8. Run the battery ground cable between the main harness and the branched main harness that goes to the ECU.
9. Hold the main harness to the rear fender.
10. Hold the fuel pump lead connector to the bracket.
11. Run the starter motor cable to under the fuse box.
12. Fuse Box
13. Starter Relay
14. Run the alternator lead and main harness (to regulator/rectifier) to under the rear frame.
15. ECU
16. Hold the main harness to the ECU bracket.
17. Insert the clip on the main harness to the tab on the rear fender to hold the main harness.
18. Run the battery ground cable to under the relay box.
19. Relay Box
20. Accessory Relay
21. Hold the accessory relay and battery positive (+) lead connector to the bracket and insert it into the rear fender.
22. Battery Positive (+) Lead Connector
23. Battery Positive (+) Cable
24. Hold the main harness with the clamp so that it positions away from the bracket (KLZ1000AC early model only).

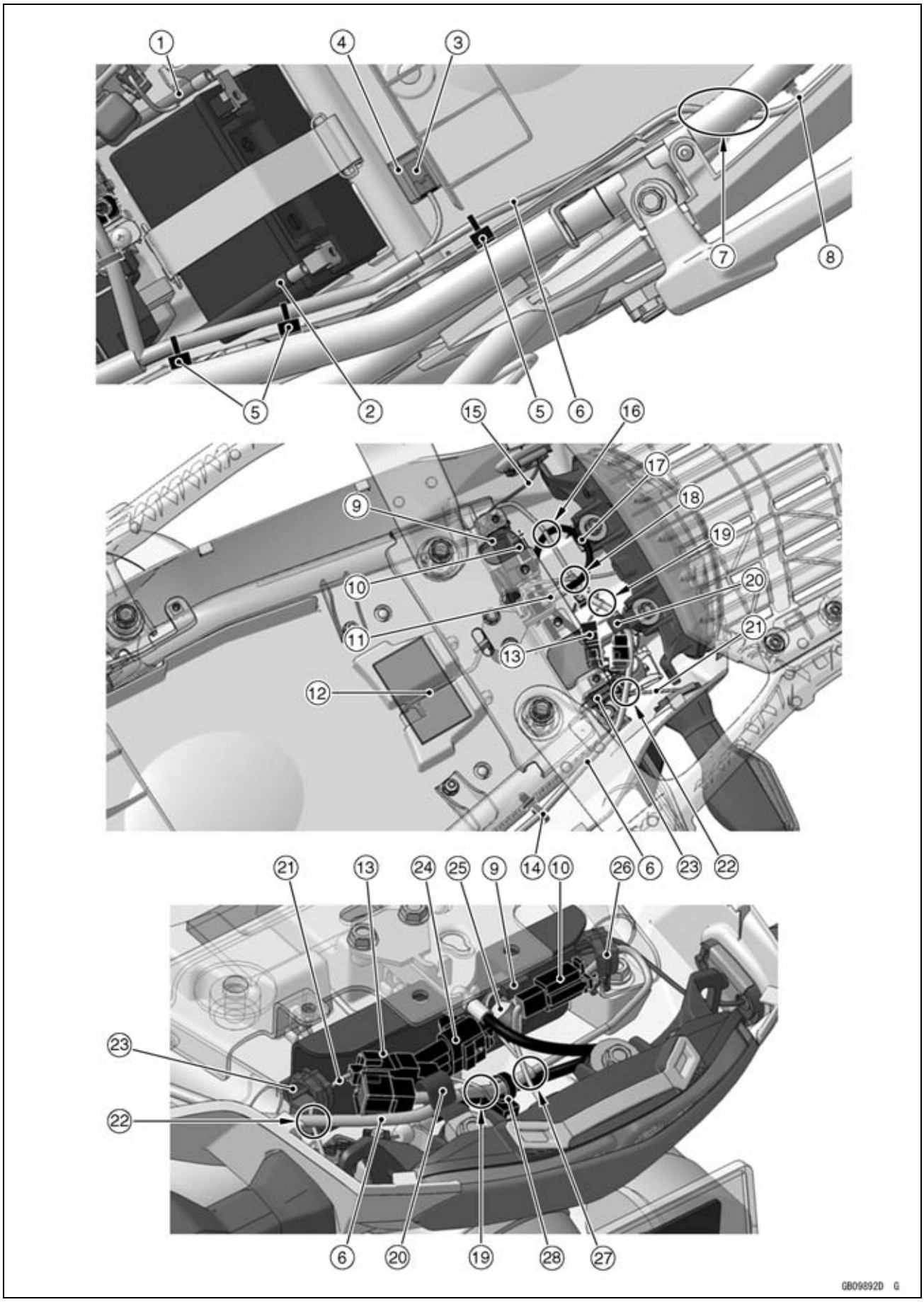
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Hold the oxygen sensor lead, rear wheel rotation sensor lead, rear brake light switch lead and crankshaft sensor lead to the frame with clamp.
2. Hold the rear brake light switch lead at both sides of the connector with the clamp. Do not hold the rear brake light switch lead at the connector.
3. Hold the oxygen sensor lead, rear wheel rotation sensor lead, rear brake light switch lead and crankshaft sensor lead with clamp.
4. Hold the oxygen sensor lead and crankshaft sensor lead with clamp.
5. Hold the alternator subharness to the rear frame pipe with band. After tying them, cut the band excess length and face its knot downward.
6. Hold the main harness to the ECU bracket with clamp.
7. Hold the main harness to the rear fender with the blade clips on the main harness.
8. Section A-A
9. Starter Motor Cable
10. Main Harness (to Rear Lights)
11. Main Harness (to ECU)
12. Battery Ground Cable
13. Hold the main harness (to ECU) with clamp.
14. Alternator Lead Connectors
15. Relay Box Leads
16. Run the battery ground cable to under the relay box.
17. Run the starter motor cable to under the fuse box.
18. Fuse Box
19. Starter Relay
20. Accessory Relay
21. Hold the accessory relay and battery positive (+) lead connector to the rear fender with bracket.
22. Battery Positive (+) Lead Connector
23. Battery Positive (+) Cable
24. Position the battery positive (+) terminal as shown.
25. Hold the ABS Kawasaki self-diagnosis system connector on the bracket.
26. ABS Self-diagnosis Terminal
27. Fuel Pump Lead
28. Hold the fuel pump lead connector on the bracket.
29. ECU
30. Battery Ground Cable
31. Hold the main harness with the clamp so that it positions away from the bracket (KLZ1000AC early model only).

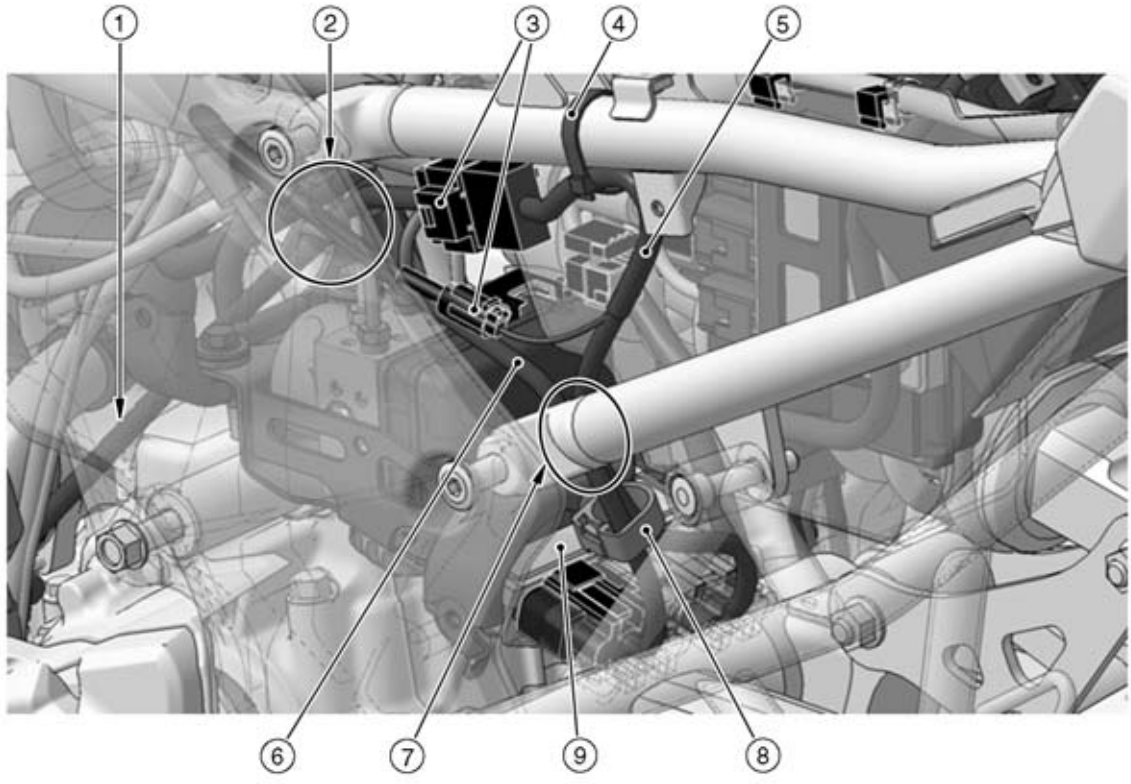
Cable, Wire, and Hose Routing

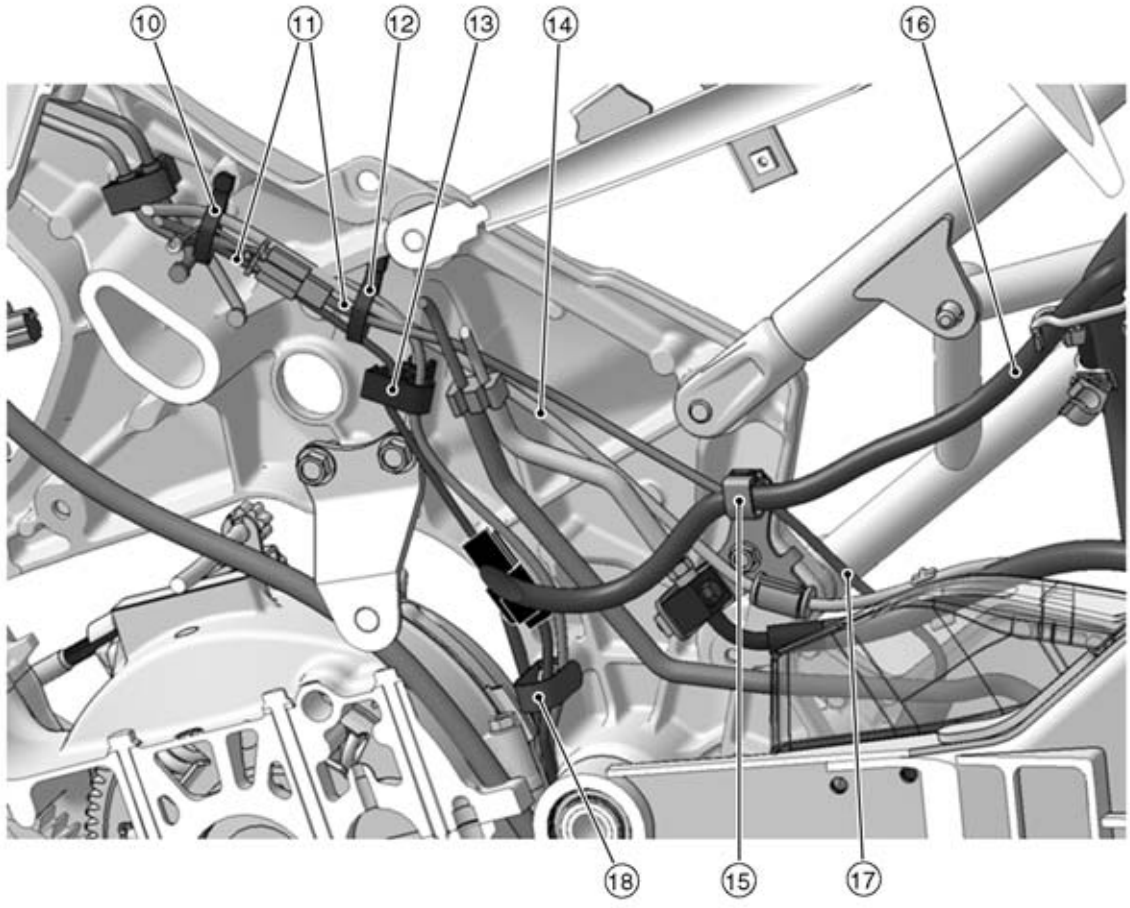


Cable, Wire, and Hose Routing

1. Battery Positive (+) Cable
2. Battery Ground Cable
3. Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector
4. Insert the diagnostic system connector into the pad to hold it on the rear fender.
5. Hold the main harness to the rear fender with the blade clips on the main harness.
6. Main Harness (to Rear Lights)
7. Run the main harness to under the rear frame.
8. Hold the main harness to the rear fender with clip.
9. Rear Right Turn Signal Light Lead Connector
10. License Plate Light Lead Connector
11. Tail/Brake Light (LED) Lead Connector
12. Run the licence plate light lead under the pad on the rear fender.
13. Rear Left Turn Signal Light Lead Connector
14. Hold the main harness to the rear fender with clip.
15. Rear Right Turn Signal Light Lead
16. Run the license plate light lead to upside of the seat lock cable.
17. Seat Lock Cable
18. Run the main harness and tail/brake light (LED) lead to under the seat lock cable.
19. Run the rear left turn signal light lead to upside of the main harness.
20. Hold the main harness with clamp.
21. Rear Left Turn Signal Light Lead
22. Run the rear left turn signal light lead to under the main harness.
23. Hold the main harness and rear left turn signal light leads with clamp.
24. Insert the tail/brake light (LED) lead connector into the hole on the guard to hold it.
25. Run the license plate light lead through the hole on the guard.
26. Hold the rear right turn signal light lead and license plate light lead with clamp.
27. Run the tail/brake light (LED) lead to upside of the main harness.
28. Hold the main harness to the rear fender with the blade clips on the main harness.

Cable, Wire, and Hose Routing





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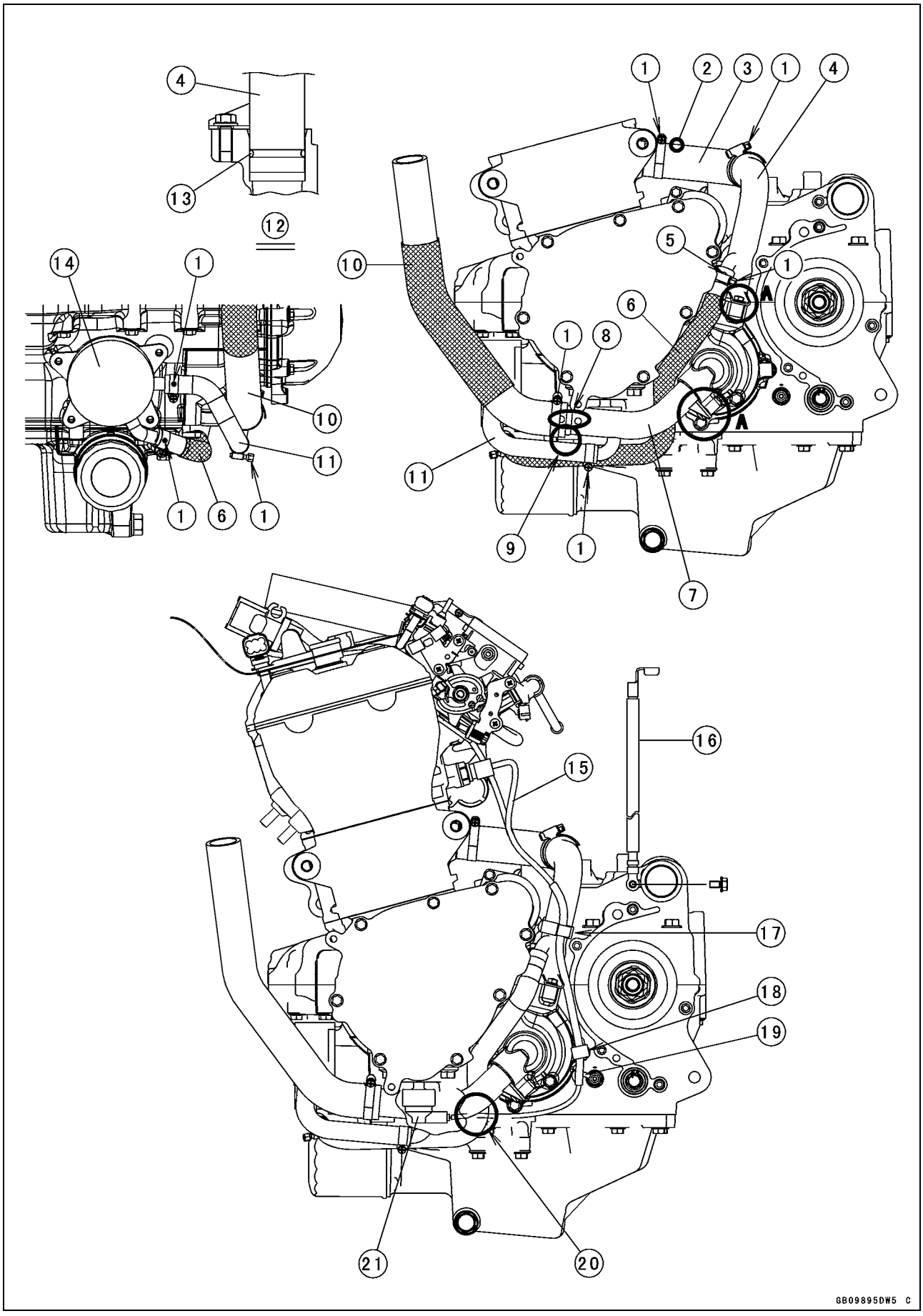
Cable, Wire, and Hose Routing

1. Alternator Lead
2. Run the alternator lead between the brake pipes above the ABS hydraulic unit.
3. Alternator Lead Connectors
4. Hold the alternator subharness to the rear frame with band. After tying them, cut the band excess length and face its knot downward.
5. Alternator Subharness (between Alternator Lead and Regulator/Rectifier)
6. Main Harness (to Regulator/Rectifier)
7. Run the alternator subharness and main harness (to regulator/rectifier) through the inside of the rear frame pipe.
8. Hold the alternator subharness and main harness (to regulator/rectifier) with clamp*.
9. Regulator/Rectifier
10. Hold the oxygen sensor lead, rear wheel rotation sensor lead, rear brake light switch lead and crankshaft sensor lead to the frame with clamp.
11. Hold the rear brake light switch lead at both sides of the connector with the clamp. Do not hold the rear brake light switch lead at the connector.
12. Hold the oxygen sensor lead, rear wheel rotation sensor lead, rear brake light switch lead and crankshaft sensor lead with clamp.
13. Hold the oxygen sensor lead and rear wheel rotation sensor lead to the frame with clamp.
14. Rear Wheel Rotation Sensor Lead
15. Hold the rear shock absorber adjuster hose and rear brake light switch lead to the frame with clamp*.
16. Rear Shock Absorber Adjuster Hose
17. Rear Brake Light Switch Lead
18. Hold the oxygen sensor lead and rear wheel rotation sensor lead by bending the clamp rearward.

*: Before clamping, face the locking portion of the clamp in direction as shown.

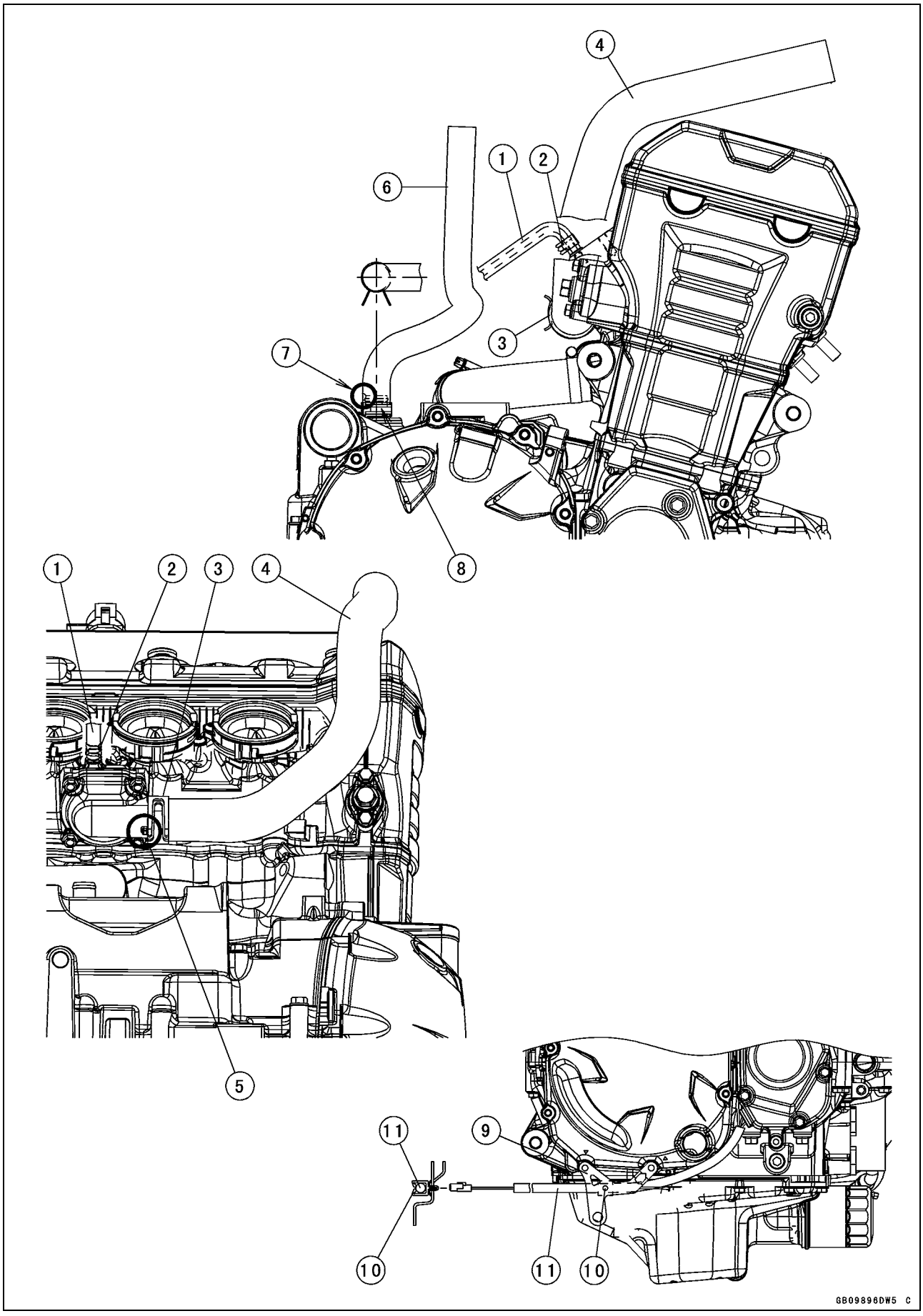
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Install the hose clamps so that its screw head face direction as shown.
2. White Paint Mark (Install the water hose so that the white paint mark faces upside.)
3. Water Hose
4. Water Pipe (Upper)
5. White Paint Mark (Install the water hose so that the white paint mark faces outside.)
6. Water Hose (with Protective Mesh)
7. Water Pipe (Lower)
8. Align the white paint mark on the water hose with white paint mark on the water pipe.
9. Insert the radiator hose to the water pipe until it stops against the stopper on the water pipe.
10. Radiator Hose
11. Water Hose
12. Detail A (2 places)
13. O-ring (Apply soapy water to protect the O-ring from damage during installation.)
14. Oil Cooler
15. Engine Subharness
16. Battery Ground Cable
17. Harness Holder (Install the harness holder at the places where higher than the branching point of the water pipe to hold the engine subharness to the water pipe.)
18. Hold the sidestand switch lead with the clamp on the water pump cover.
19. Neutral Switch Lead (Do not pull the lead after connected.)
20. Run the oil pressure switch lead to the inside of the water pipe.
21. Cover the oil pressure switch with the switch cover.

Cable, Wire, and Hose Routing

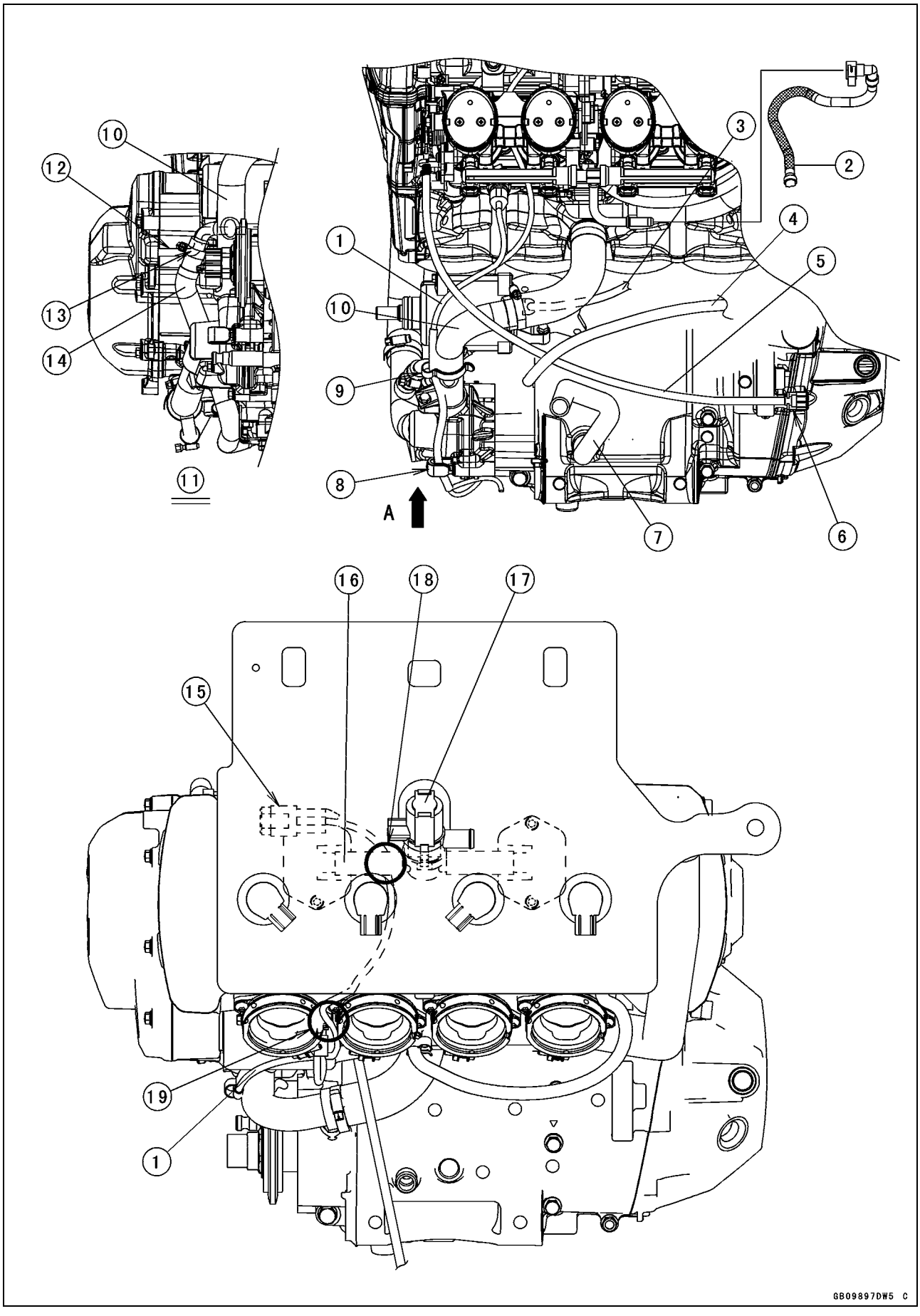


Cable, Wire, and Hose Routing

1. Water Hose (Cylinder Head to Radiator Filler Neck)
2. Hose Clamp**
3. Hose Clamp**
4. Water Hose (Thermostat Housing to Radiator Filler Neck)
5. Tab (Insert the water hose to the thermostat housing cover until it stops against the tab.)
6. Breather Hose (from Upper Crankcase to Air Cleaner Case)
7. White Paint Mark (Install the breather hose so that the white paint mark faces rearward.)
8. Hose Clamp**
9. Bracket
10. Clamp
11. Crankshaft Sensor Lead

**: Face the tabs of the hose clamp in direction as shown.

Cable, Wire, and Hose Routing

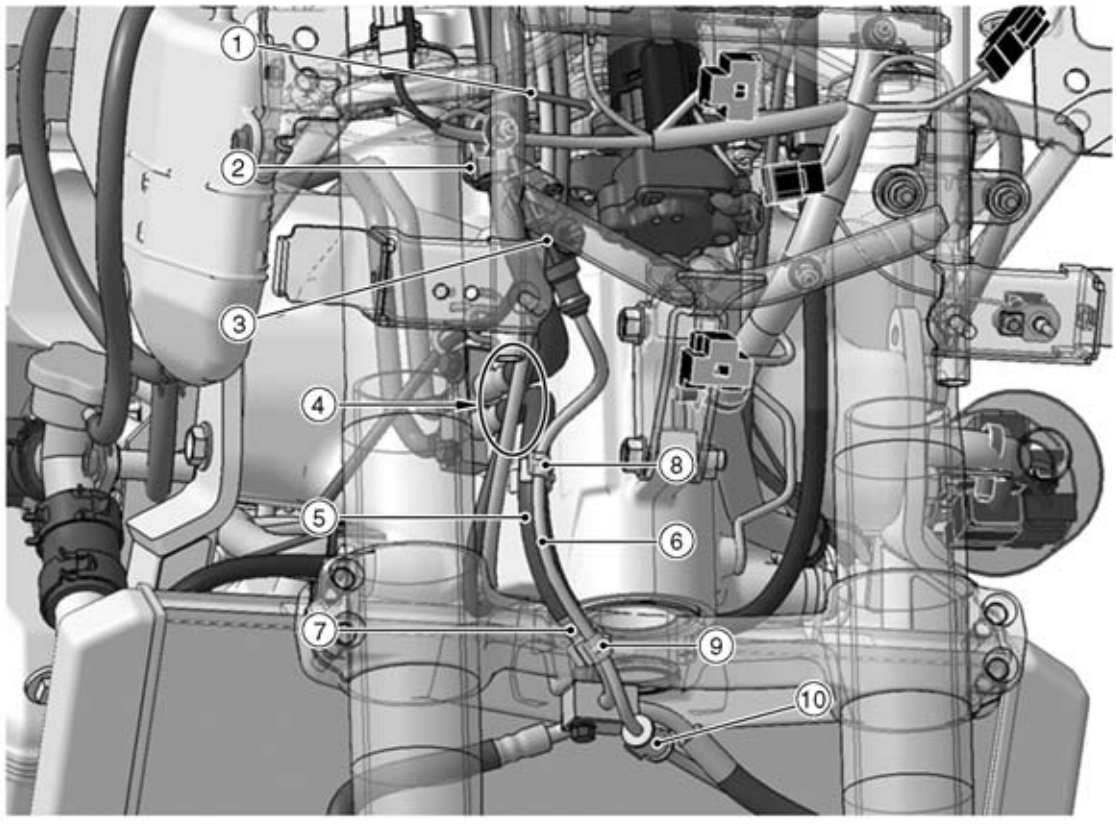


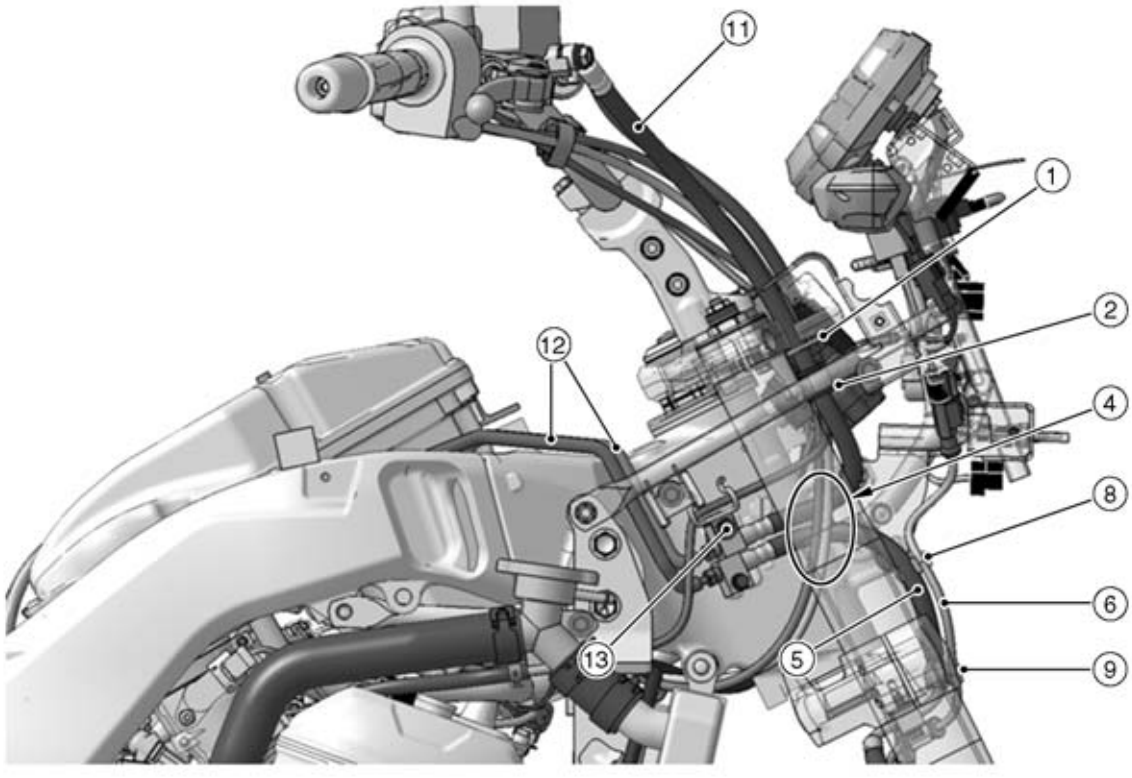
Cable, Wire, and Hose Routing

1. Engine Subharness
2. Install the fuel hose with protective mesh side toward the fuel tank.
3. Starter Motor Cable
4. Battery Ground Cable
5. Idle Adjusting Cable
6. Hold the idle adjusting screw with the holder on the clutch cover.
7. Breather Hose
8. Hold the sidestand switch lead with the clamp.
9. Install the harness holder at the places where higher than the branching point of the water pipe to hold the engine subharness to the water pipe.
10. Water Pipe (Upper)
11. View A
12. Run the alternator lead between the water pipe and crankcase.
13. Hose Clamp**
14. Water Hose
15. Engine Subharness Connector
16. Air Hose
17. Air Switching Valve
18. Run the engine subharness to under the air hose.
19. Run the engine subharness between the #1 and #2 throttle body assy holders as shown. Be careful not to pinch the engine subharness with the throttle body.

**: Face the tabs of the hose clamp in direction as shown.

Cable, Wire, and Hose Routing





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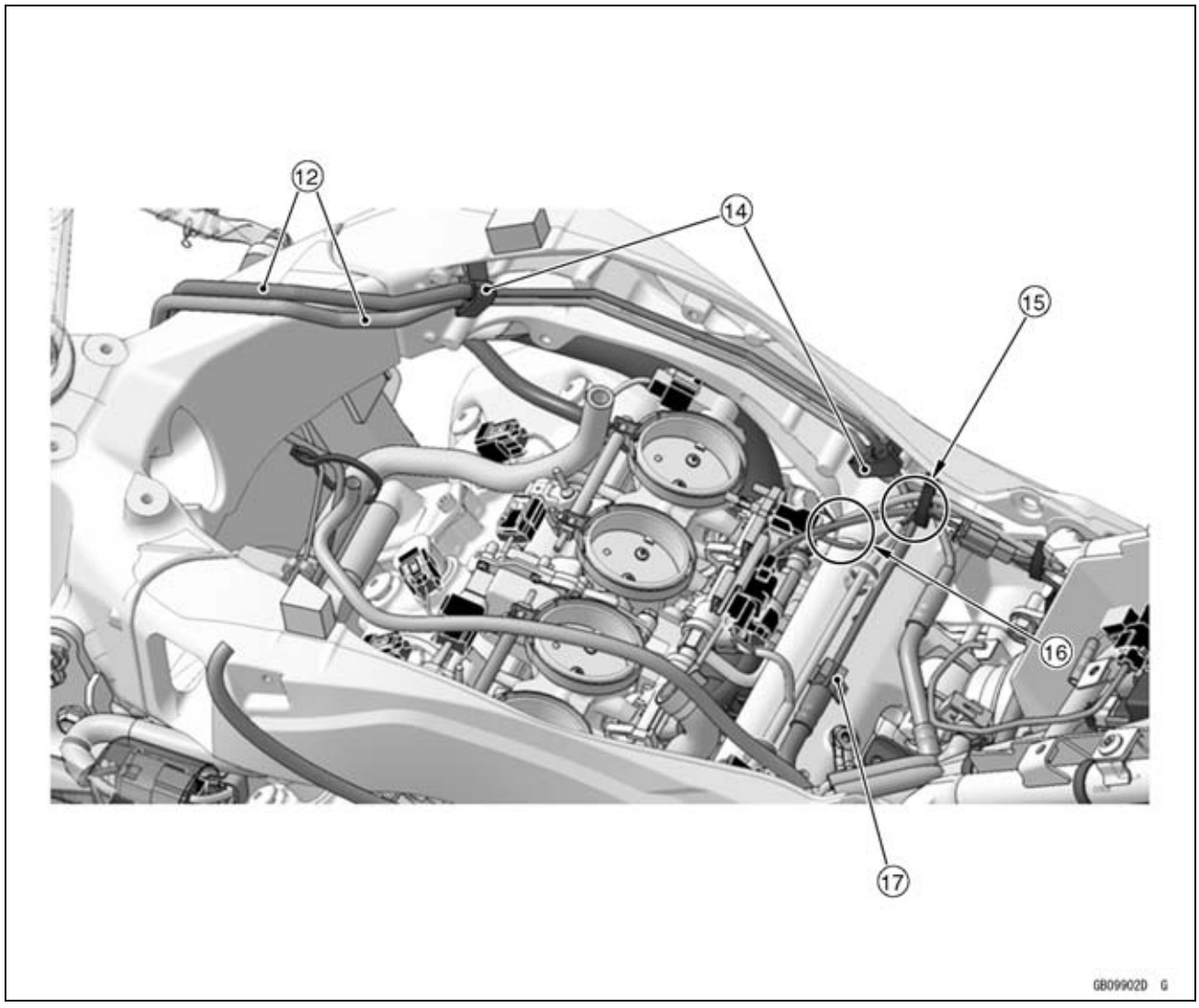
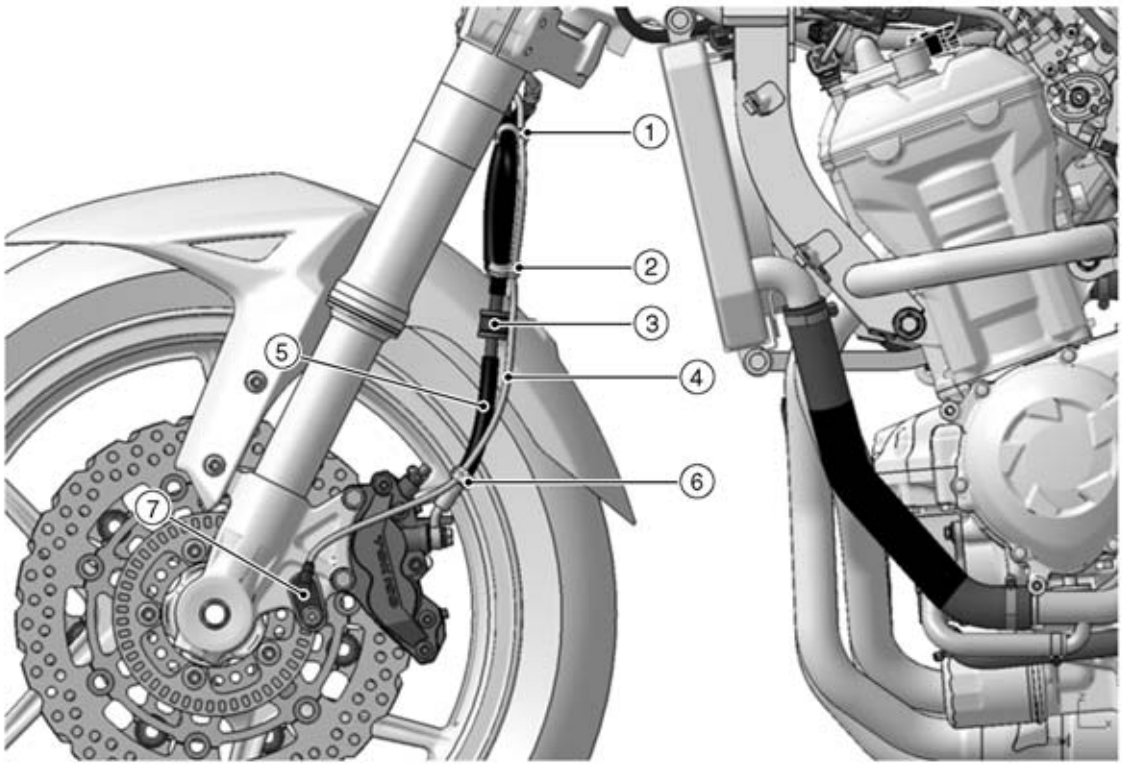
Cable, Wire, and Hose Routing

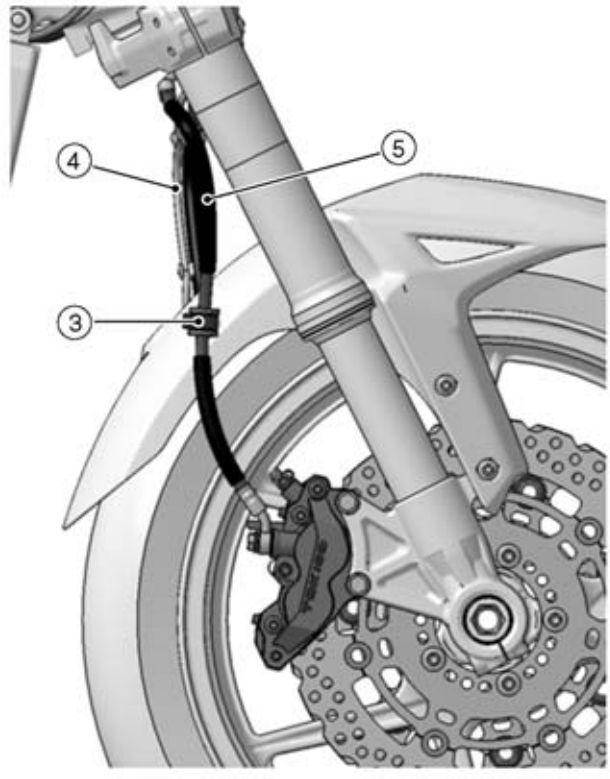


1. Run the brake hose, right switch housing lead and throttle cables into the guide.
2. Hold the brake hose with the clamp* at the rubber protector.
3. Hold the front wheel rotation sensor lead to the meter bracket.
4. Run the brake hoses to inside of the throttle cables.
5. Brake Hose
6. Front Wheel Rotation Sensor Lead
7. Brake Hose Fitting
8. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at front of the hose, and face its open side in direction as shown.
9. Hold the front wheel rotation sensor lead to the brake hose fitting with the clip at the white mark on the lead. Install the clip so that the lead is placed at front of the hose, and face its open side in direction as shown.
10. Hold the front wheel rotation sensor lead with clamp.
11. Brake Hose
12. Brake Pipes
13. Clamp
14. Hold the brake pipes to the frame with clamps.
15. Run the brake pipes to under the other leads.
16. Run the rear wheel rotation sensor lead to the outside of the main harness, upside of the intake air temperature sensor lead and under the crankshaft sensor lead.
17. Clamp

*: Before clamping, face the locking portion of the clamp in direction as shown.

Cable, Wire, and Hose Routing



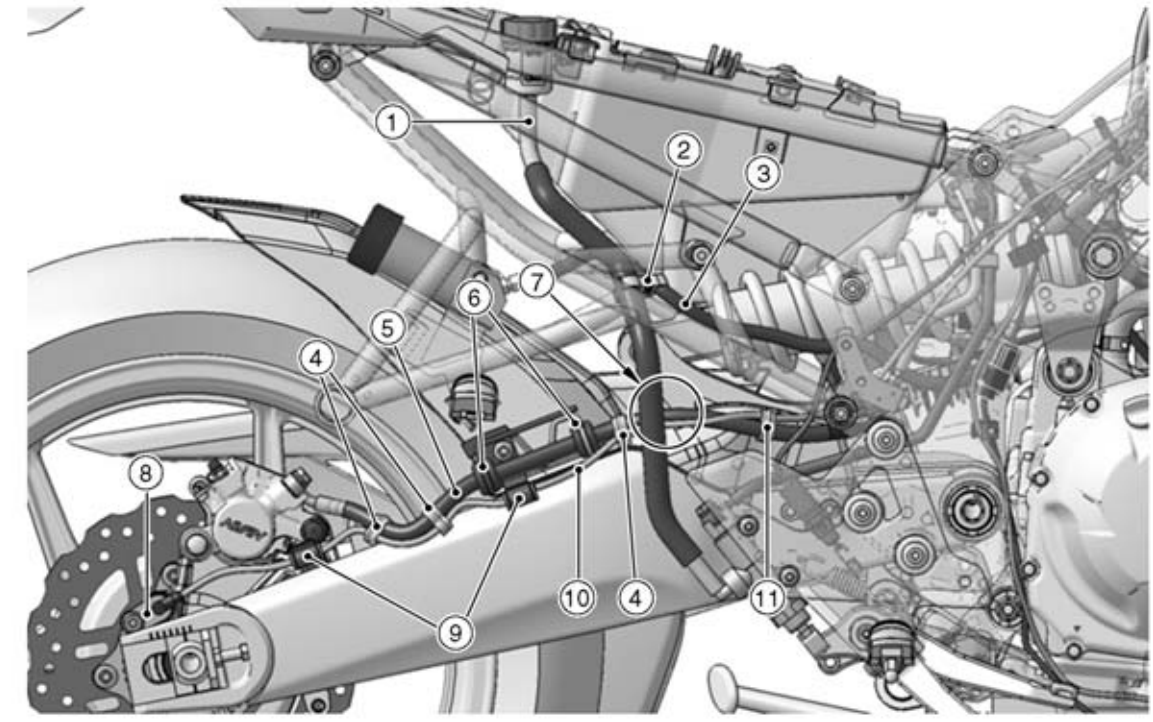


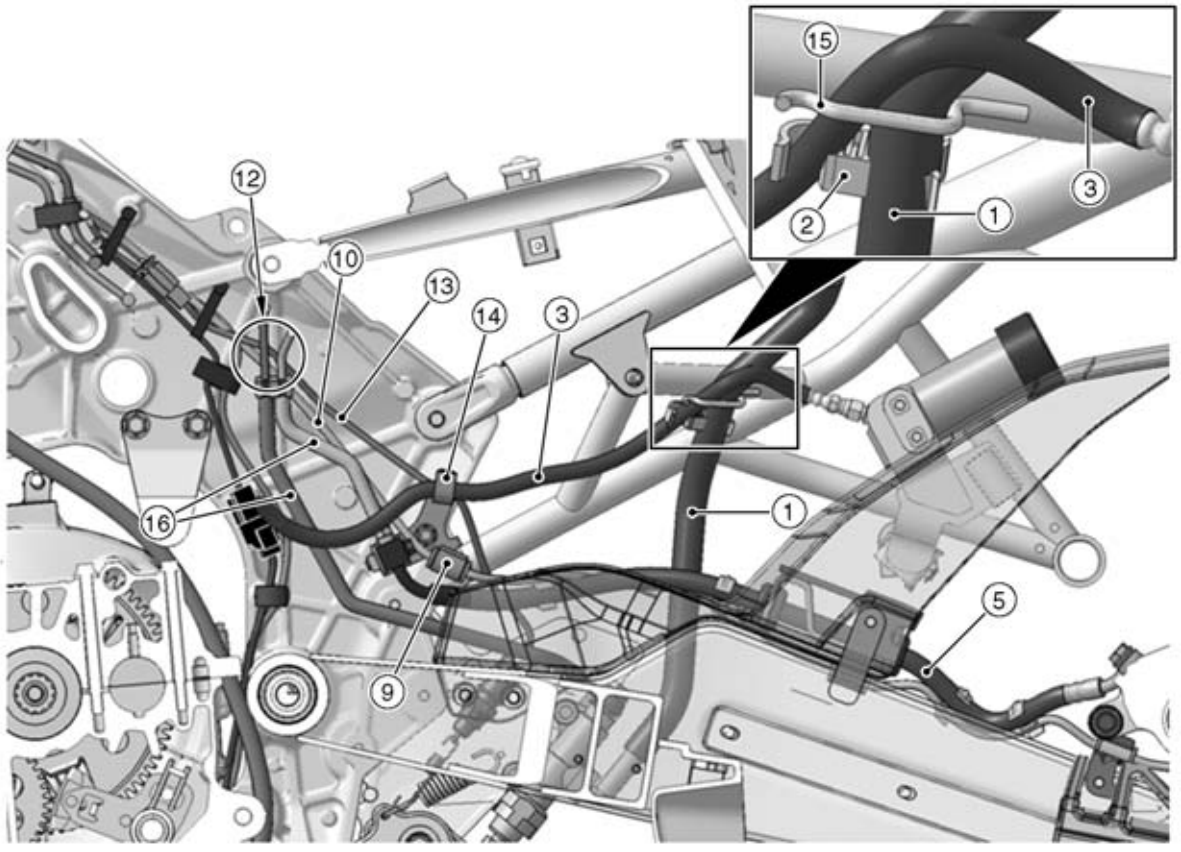
GB098990 G

Cable, Wire, and Hose Routing

1. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at rear of the hose, and face its open side in direction as shown.
2. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead placed approx. 10 mm (0.4 mm) above the clamp. Install the clip so that the lead is placed at rear of the hose, and face its open side in direction as shown.
3. Hold the brake hose at the rubber protector to the front fender with the clamp. Before clamping, face the locking portion of the clamp to backward. Do not hold the front wheel rotation sensor lead with this clamp.
4. Front Wheel Rotation Sensor Lead
5. Brake Hose
6. Hold the front wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at outside of the hose, and face its open side in direction as shown.
7. Front Wheel Rotation Sensor

Cable, Wire, and Hose Routing





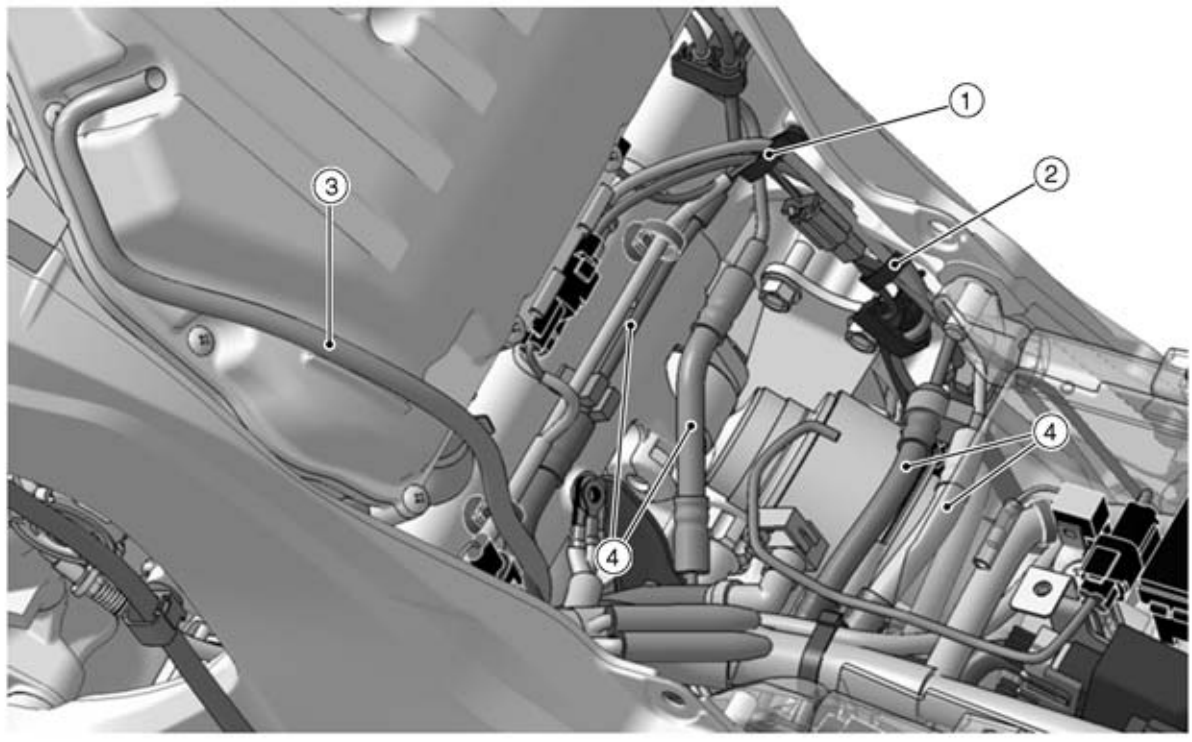
GB099000 G

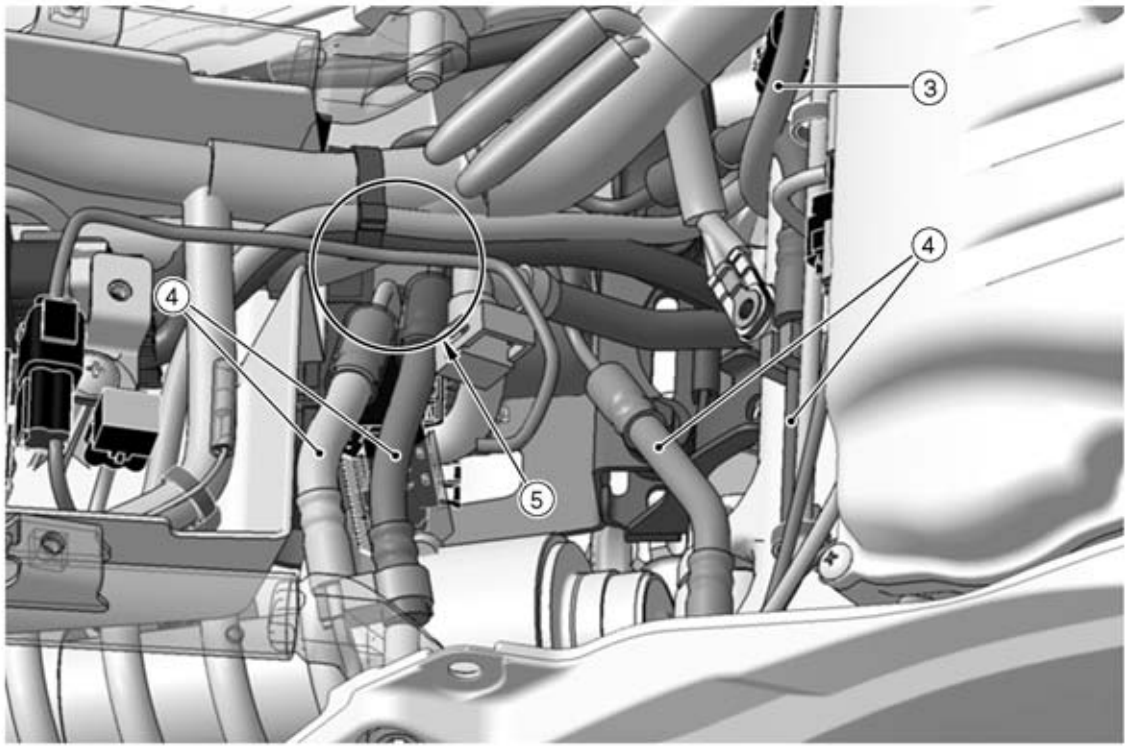
Cable, Wire, and Hose Routing

1. Rear Brake Reservoir Hose
2. Clamp (Hold the rear brake reservoir hose and rear shock absorber adjuster hose together as shown.)
3. Rear Shock Absorber Adjuster Hose
4. Hold the rear wheel rotation sensor lead to the brake hose with the clip at the white marks on the lead. Install the clips so that the lead is placed at under the hose, and face its open side in direction as shown.
5. Rear Brake Hose
6. Hold the brake hose at the rubber protector with the clamps.
7. Run the rear brake reservoir hose to outside of the rear brake hose.
8. Rear Wheel Rotation Sensor
9. Hold the rear wheel rotation sensor lead at the rubber protector with the clamps.
10. Rear Wheel Rotation Sensor Lead
11. Hold the rear wheel rotation sensor lead to the brake hose with the clip at the white mark on the lead. Install the clip so that the lead is placed at outside of the hose, and face its open side in direction as shown.
12. Run the rear brake light switch lead and rear wheel rotation sensor lead to outside of the brake pipes.
13. Rear Brake Light Switch Lead
14. Hold the rear shock absorber adjuster hose and rear brake light switch lead to the frame with clamp*.
15. Hold the rear shock absorber adjuster hose and rear brake light switch lead to the rear frame with clamp.
16. Brake Pipes

*: Before clamping, face the locking portion of the clamp in direction as shown.

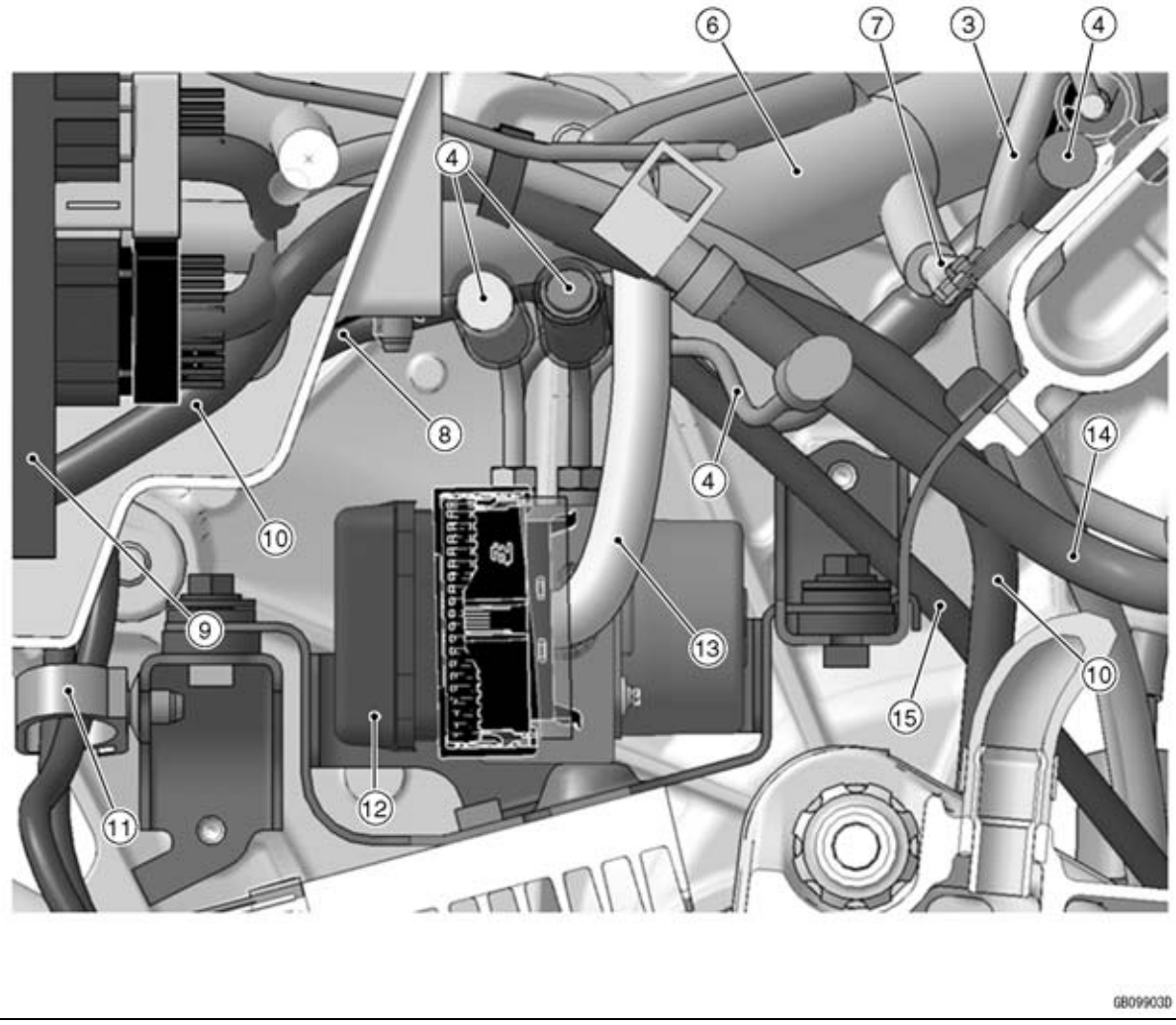
Cable, Wire, and Hose Routing





GB09901D G

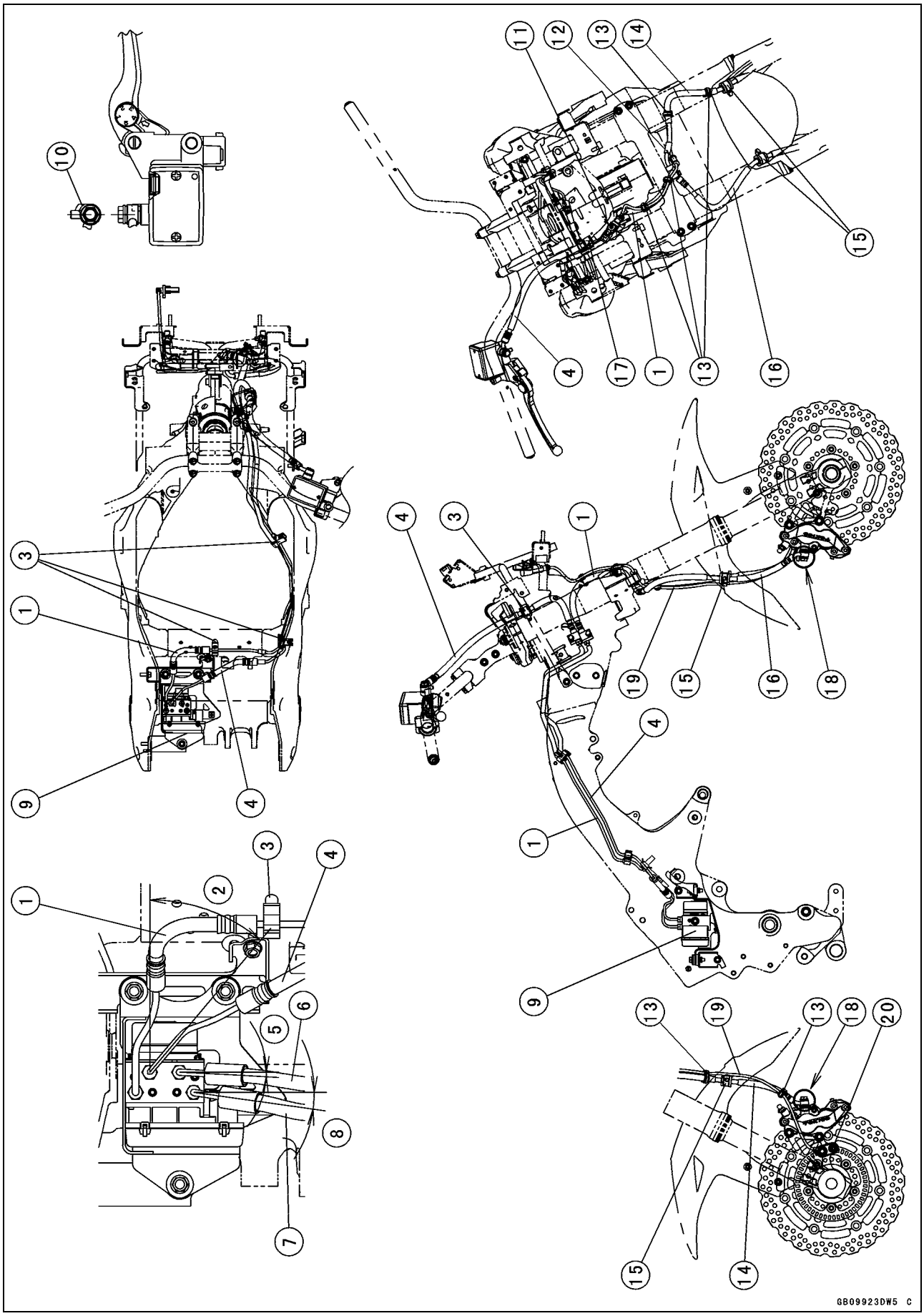
Cable, Wire, and Hose Routing



1. Hold the oxygen sensor lead, rear wheel rotation sensor lead, rear brake light switch lead and crankshaft sensor lead to the frame with clamp.
2. Hold the oxygen sensor lead, rear wheel rotation sensor lead, rear brake light switch lead and crankshaft sensor lead with clamp.
3. Run the fuel tank drain hose along the air cleaner cover as shown.
4. Brake Pipes
5. Run the brake pipes to under the starter motor cable, battery ground cable, alternator lead and main harness.
6. Main Harness
7. Frame Ground Terminal
8. Main Harness (to Regulator/Rectifier)
9. ECU
10. Battery Ground Cable
11. Hold the alternator subharness and main harness (to regulator/rectifier) with clamp*.
12. ABS Hydraulic Unit
13. Main Harness (to ABS Hydraulic Unit)
14. Fuel Hose
15. Alternator Lead

*: Before clamping, face the locking portion of the clamp in direction as shown.

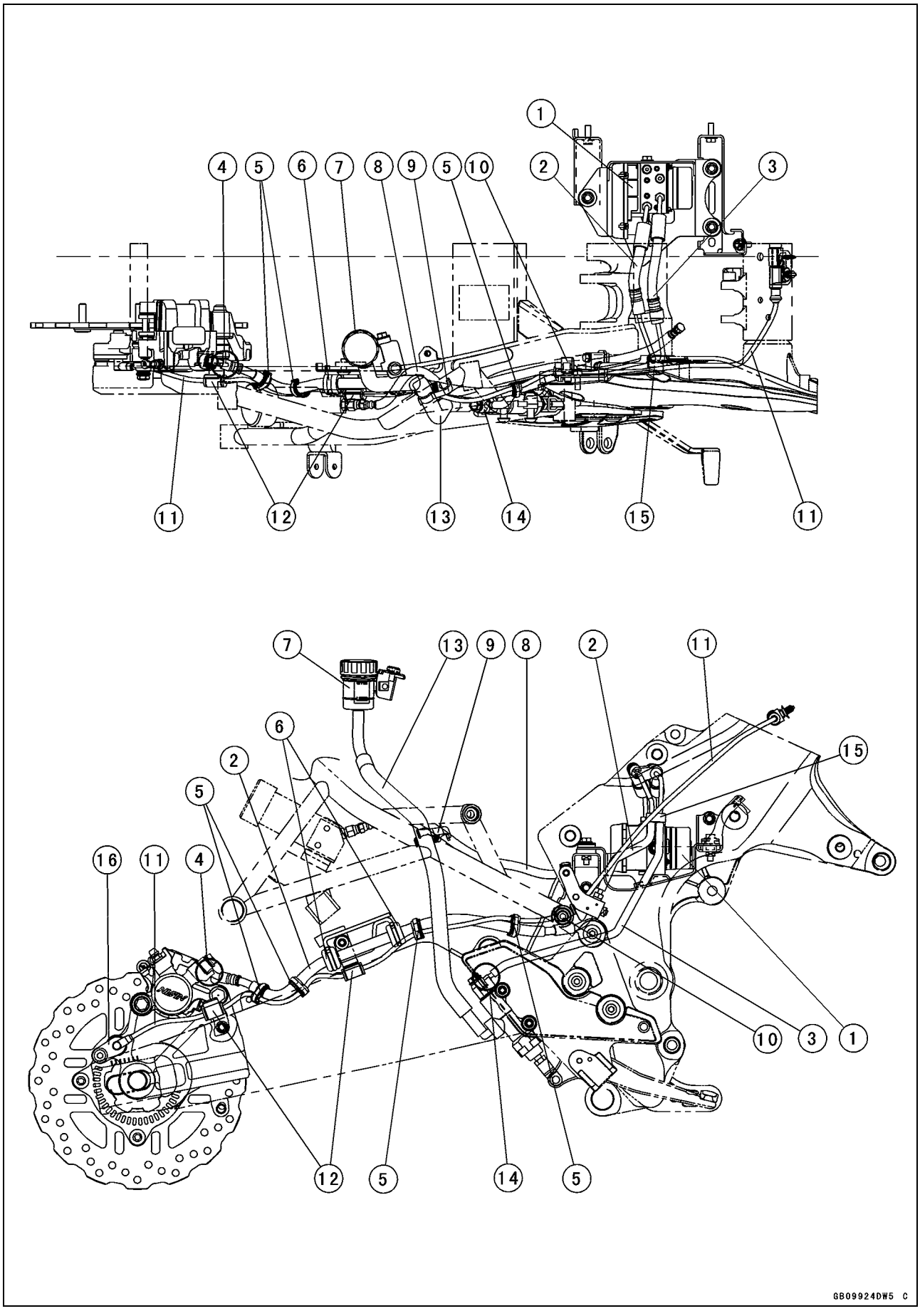
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Brake Hose (between ABS Hydraulic Unit and Front Calipers)
2. about 40°
3. Clamps
4. Brake Hose (between Front Master Cylinder and ABS Hydraulic Unit)
5. about 3°
6. Brake Hose (between Rear Master Cylinder and ABS Hydraulic Unit)
7. Brake Hose (between ABS Hydraulic Unit and Rear Caliper)
8. about 9°
9. ABS Hydraulic Unit
10. Fit the projection on the brake hose to the stopper on the master cylinder.
11. Hold the front wheel rotation sensor lead to the meter bracket.
12. Clamp
13. Clips
14. Brake Hose (between ABS Hydraulic Unit and Left Front Caliper)
15. Clamps
16. Brake Hose (between ABS Hydraulic Unit and Right Front Caliper)
17. Hold the brake hose with the clamp at the rubber protector.
18. Fit the projection on the brake hose to the stopper on the caliper.
19. Front Wheel Rotation Sensor Lead
20. Front Wheel Rotation Sensor

Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. ABS Hydraulic Unit
2. Brake Hose (see 17-45 page for direction. between ABS Hydraulic Unit and Rear Caliper)
3. Brake Hose (see 17-45 page for direction. between Rear Master Cylinder and ABS Hydraulic Unit)
4. Fit the brake hose end pipe to the groove on the caliper.
5. Clips
6. Hold the brake hose at the rubber protector with the clamps.
7. Rear Brake Reservoir
8. Rear Shock Absorber Adjuster Hose
9. Hold the rear brake reservoir hose and rear shock absorber adjuster hose together with the clamp.
10. Clamp
11. Rear Wheel Rotation Sensor Lead
12. Hold the rear wheel rotation sensor lead at the rubber protector with the clamps.
13. Rear Brake Reservoir Hose
14. Fit the brake hose end pipe to the stopper on the master cylinder.
15. Clamp
16. Rear Wheel Rotation Sensor

Troubleshooting Guide

NOTE

○*Refer to the Fuel System chapter for most of DFI troubleshooting guide.*

○*This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.*

Engine Doesn't Start, Starting Difficulty:

Starter motor not rotating:
- Ignition and engine stop switch not ON
- Starter lockout switch or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relay not contacting or operating
- Starter button not contacting
- Starter system wiring shorted or open
- Ignition switch trouble
- Engine stop switch trouble
- Main 30 A or ignition fuse blown

Starter motor rotating but engine doesn't turn over:
- Vehicle-down sensor (DFI) coming off
- Immobilizer system trouble (Equipped Models)
- Starter clutch trouble
- Starter idle gear trouble

Engine won't turn over:
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure
- Balancer bearing seizure

No fuel flow:
- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

No spark; spark weak:
- Vehicle-down sensor (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned OFF
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- Immobilizer system trouble (Equipped Models)
- Spark plug dirty, broken, or gap maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact
- Stick coil trouble
- ECU trouble
- Neutral, starter lockout, or sidestand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine stop switch shorted
- Starter system wiring shorted or open
- Main 30 A or ignition fuse blown

Fuel/air mixture incorrect:
- Bypass screw and/or idle adjusting screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Leak from oil filler cap, crankcase breather hose or air cleaner drain hose.

Compression Low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- No valve clearance
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed:

Spark weak:
- Battery voltage low
- Immobilizer system trouble (Equipped Models)
- Stick coil trouble
- Stick coil shorted or not in good contact
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble
- Crankshaft sensor trouble

Fuel/air mixture incorrect:
- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Throttle body assy holder loose

Air cleaner duct loose
Compression low:
Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
Carbon accumulating on valve seating surface
Camshaft cam worm
Run-on (dieseling):
Ignition switch trouble
Engine stop switch trouble
Fuel injector trouble
Loosen terminal of battery (–) cable or ECU ground lead
Carbon built up in combustion chamber
Engine overheating
Other:
ECU trouble
Throttle body assy not synchronizing
Engine oil viscosity too high
Drive train trouble
Brake dragging
Clutch slipping
Engine overheating
Air suction valve trouble
Air switching valve trouble

Poor Running or No Power at High Speed:

Firing incorrect:
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
Stick coil shorted or not in good contact trouble
Stick coil trouble
ECU trouble
Fuel/air mixture incorrect:
Air cleaner clogged, poorly sealed, or missing
Air cleaner duct loose
Water or foreign matter in fuel
Throttle body assy holder loose
Fuel to injector insufficient
Fuel tank air vent obstructed
Fuel line clogged
Fuel pump trouble
Compression low:
Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)
Knocking:
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
ECU trouble
Miscellaneous:
Throttle valve won't fully open
Brake dragging
Clutch slipping
Engine overheating
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Camshaft cam worm
Air suction valve trouble
Air switching valve trouble
Catalytic converter melt down due to muffler overheating (KLEEN)

Overheating:

Firing incorrect:
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
ECU trouble
Muffler overheating:
For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)
For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)
For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil
For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)
ECU trouble
Fuel/air mixture incorrect:
Throttle body assy holder loose

Troubleshooting Guide

Air cleaner duct loose
Air cleaner poorly sealed, or missing
Air cleaner clogged

Compression high:
Carbon built up in combustion chamber

Engine load faulty:
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Brake dragging

Lubrication inadequate:
Engine oil level too low
Engine oil poor quality or incorrect

Oil cooler incorrect:
Oil cooler clogged

Gauge incorrect:
Water temperature gauge broken
Water temperature sensor broken

Coolant incorrect:
Coolant level too low
Coolant deteriorated
Wrong coolant mixed ratio

Cooling system component incorrect:
Radiator fin damaged
Radiator clogged
Thermostat trouble
Radiator cap trouble
Radiator fan relay trouble
Fan motor broken
Fan blade damaged
Water pump not turning
Water pump impeller damaged

Over Cooling:

Gauge incorrect:
Water temperature gauge broken
Water temperature sensor broken

Cooling system component incorrect:
Thermostat trouble

Clutch Operation Faulty:

Clutch slipping:
Friction plate worn or warped
Steel plate worn or warped
Clutch spring broken or weak
Clutch hub or housing unevenly worn
No clutch lever play
Clutch inner cable trouble
Clutch release mechanism trouble

Clutch not disengaging properly:
Clutch plate warped or too rough
Clutch spring compression uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch hub nut loose
Clutch hub spline damaged
Clutch friction plate installed wrong
Clutch lever play excessive
Clutch release mechanism trouble

Gear Shifting Faulty:

Doesn't go into gear; shift pedal doesn't return:
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft
Gear positioning lever binding
Shift return spring weak or broken
Shift return spring pin loose
Shift mechanism arm spring broken
Shift mechanism arm broken
Shift pawl broken

Jumps out of gear:
Shift fork ear worn, bent
Gear groove worn
Gear dogs and/or dog holes worn
Shift drum groove worn
Gear positioning lever spring weak or broken
Shift fork guide pin worn
Drive shaft, output shaft, and/or gear splines worn

Overshifts:
Gear positioning lever spring weak or broken
Shift mechanism arm spring broken

Abnormal Engine Noise:

Knocking:
ECU trouble
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
Overheating

Piston slap:
Cylinder/piston clearance excessive
Cylinder, piston worn
Connecting rod bent
Piston pin, piston pin hole worn

Valve noise:
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn
Valve lifter worn

Other noise:
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring/groove clearance excessive
Piston ring worn, broken, or stuck

Troubleshooting Guide

Piston ring groove worn
Piston seizure, damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mount loose
Crankshaft bearing worn
Primary gear worn or chipped
Camshaft chain tensioner trouble
Camshaft chain, sprocket, guide worn
Air suction valve damaged
Air switching valve damaged
Alternator rotor loose
Catalytic converter melt down due to muffler overheating (KLEEN)
Balancer gear worn or chipped
Balancer shaft position maladjusted
Balancer bearing worn
Balancer rubber damper damaged

Abnormal Drive Train Noise:

Clutch noise:
Clutch damper weak or damaged
Clutch housing/friction plate clearance excessive
Clutch housing gear worn
Wrong installation of outside friction plate

Transmission noise:
Bearings worn
Transmission gear worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

Drive line noise:
Drive chain adjusted improperly
Drive chain worn
Rear and/or engine sprocket worn
Chain lubrication insufficient
Rear wheel misaligned

Abnormal Frame Noise:

Front fork noise:
Oil insufficient or too thin
Spring weak or broken

Rear shock absorber noise:
Shock absorber damaged

Disc brake noise:
Pad installed incorrectly
Pad surface glazed
Disc warped
Caliper trouble

Other noise:
Bracket, nut, bolt, etc. not properly mounted or tightened

Red Oil Pressure Warning Indicator Light (LED) Goes On:

Engine oil pump damaged
Engine oil pump incorrect assembly
Engine oil screen clogged
Engine oil filter clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearing worn
Crankshaft bearing worn
Oil pressure switch damaged
Wiring faulty
Relief valve stuck open
O-ring at the oil passage in the crankcase damaged

Exhaust Smokes Excessively:

White smoke:
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Engine oil level too high

Black smoke:
Air cleaner clogged

Brown smoke:
Air cleaner duct loose
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory:

Handlebars hard to turn:
Cable routing incorrect
Hose routing incorrect
Wiring routing incorrect
Steering stem nut too tight
Steering stem bearing damaged
Steering stem bearing lubrication inadequate
Steering stem bent
Tire air pressure too low

Handlebars shakes or excessively vibrates:
Tire worn
Swingarm pivot bearing worn
Rim warped, or not balanced
Wheel bearing worn
Handlebar holder bolt loose
Steering stem nut loose
Front, rear axle runout excessive
Engine mounting bolt loose

Handlebars pulls to one side:
Frame bent
Wheel misalignment
Swingarm bent or twisted
Swingarm pivot shaft runout excessive
Steering maladjusted

Troubleshooting Guide

Front fork bent
Right and left front fork oil level uneven

Shock absorption unsatisfactory:
(Too hard)
Front fork oil excessive
Front fork oil viscosity too high
Rear shock absorber adjustment too hard
Tire air pressure too high
Front fork bent
(Too soft)
Tire air pressure too low
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Rear shock adjustment too soft
Front fork, rear shock absorber spring weak
Rear shock absorber oil leaking

Brake Doesn't Hold:

Air in the brake line
Pad or disc worn
Brake fluid leakage
Disc warped
Contaminated pad
Brake fluid deteriorated
Primary or secondary cup damaged in master cylinder
Master cylinder scratched inside

Battery Trouble:

Battery discharged:
Charge insufficient
Battery faulty (too low terminal voltage)
Battery cable making poor contact
Load excessive (e.g., bulb of excessive wattage)
Ignition switch trouble
Alternator trouble
Wiring faulty
Regulator/rectifier trouble

Battery overcharged:
Alternator trouble
Regulator/rectifier trouble
Battery faulty

MODEL APPLICATION

Year	Model	Beginning Frame No.
2012	KLZ1000AC	JKALZCA1□CA000001 JKALZT00AAA000001

□:This digit in the frame number changes from one machine to another.

Kawasaki
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